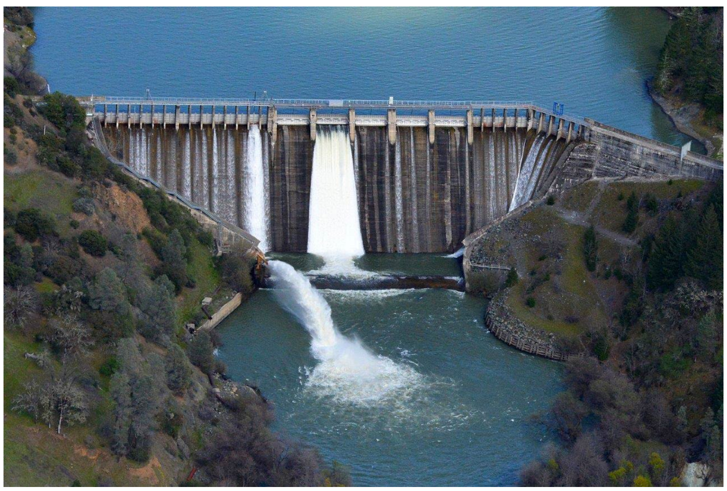
PACIFIC GAS AND ELECTRIC COMPANY

Potter Valley Hydroelectric Project
(FERC Project No. 77)

Draft Application for Surrender of License and Application for Non-Project Use of Project Lands

VOLUME I



Scott Dam

Cape Horn Dam

January 2025

This Page Intentionally Left Blank

PACIFIC GAS AND ELECTRIC COMPANY

POTTER VALLEY HYDROELECTRIC PROJECT
(FERC Project No. 77)

Draft Application for Surrender of License and Application for Non-Project Use of Project Lands

VOLUME I

January 2025

PG&E

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

CFR	Code of Federal Regulations
DSOD	Division of Safety of Dams
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
ILP	Integrated Licensing Process
mi.	mile(s)
NERF	New Eel-Russian Facility
NOI	notice of intent
NPUPL	Non-Project Use of Project Lands
PAD	pre-application document
PG&E	Pacific Gas & Electric Company
Project	Potter Valley Hydroelectric Project
Sonoma Water	Sonoma County Water Agency
Surrender Application	Draft Surrender Application and Conceptual Decommissioning Plan
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service

1.0 INTRODUCTION

Pacific Gas & Electric Company (PG&E) has prepared a Draft Surrender Application and Conceptual Decommissioning Plan (Surrender Application) for the Potter Valley Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 77) (Project) consistent with 18 Code of Federal Regulations (CFR) Section (§) 6.1. PG&E's goals upon conclusion of the decommissioning process are to (1) remove the Project facilities and features including but not limited to Scott Dam and Cape Horn Dam, (2) remove the Project from FERC and Division of Safety of Dams jurisdiction; and (3) no longer operate or maintain the Project and Project features in the future.[1]

On November 17, 2023, PG&E issued an Initial Draft Surrender Application to regulatory agencies, Tribes, and other interested parties (e.g., local governments, non-governmental organizations, and members of the public) to solicit comments on PG&E's approach for decommissioning of the Project. PG&E considered these comments in the preparation of this Draft Surrender Application. In late 2023, PG&E received a proposal from a coalition referred to as the "Proponents" (consisting of Sonoma County Water Agency [Sonoma Water], Mendocino County Inland Water and Power Commission, Humboldt County, Round Valley Indian Tribes, California Trout, Trout Unlimited, and California Department of Fish and Wildlife) for the construction and operation of the New Eel-Russian Facility (NERF) using some of the Project's existing facilities. PG&E, the Proponents, and others formed a steering committee and have worked to bring these interests in alignment with PG&E's Surrender Application and accompanying Project decommissioning plan.

This submittal reflects the agreement among PG&E and the Proponents that aligns PG&E's Project license surrender and decommissioning with the interests of the Proponents to construct and operate the NERF with the equal goals of (1) improving fish migration and habitat on the Eel River with the objective of achieving naturally reproducing, self-sustaining, and harvestable native anadromous fish populations and (2) maintaining material and continued water diversion from the Eel River through the existing tunnel to the Russian River to support water supply reliability, fisheries, and water quality in the Russian River basin. As such, this submittal includes (1) PG&E's Surrender Application and decommissioning plan for its Potter Valley Hydroelectric Project and (2) an application for Non-Project Use of Project Lands for FERC to authorize the Eel-Russian Project Authority[2] (ERPA) to construct the NERF while the license remains in effect.

This submittal requests that the Commission authorize non-Project use of Project lands under License Article 5 of Form L-5 included in the FERC License Order Issued December 4, 1983 (FERC 1983) as Amended January 28, 2004 (FERC 2004). Specifically, PG&E requests authorization to allow ERPA to modify existing Project works and construct the NERF on lands within the FERC Project boundary. This application only requests authorization for construction of certain NERF components, including the NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River. ERPA

[1] Generation at the Potter Valley Powerhouse was discontinued in 2021.

[2] The ERPA is a joint powers authority formed by a joint exercise of powers agreement between the County of Sonoma, Sonoma Water, and the Mendocino County Inland Water and Power Commission.

will complete separate environmental analyses and obtain separate permits/approvals for completing construction of the NERF and for the operation of the facility by ERPA, as described in Volume I, Section 3.0.

The Surrender Application also requests the Commission include a condition in the License Surrender Order to remove all lands and Project works necessary for the NERF from the Project boundary and FERC jurisdiction immediately after the following actions are completed: (1) PG&E has completed decommissioning work at Cape Horn Dam and other Project works associated with the NERF, (2) the NERF has been constructed, and (3) PG&E has filed a completion report with FERC on these actions, as described in Volume II, Section 2.2.1.

The Proposed Action under the Application for Surrender of License includes:

- Decommissioning and removal of Scott Dam and associated facilities and features;
- Removal and restoration of certain Project recreational facilities (e.g., campgrounds; day-use facilities; recreation access roads and trails; kiosk; and boat ramps) located on U.S. Forest Service (USFS) and PG&E lands;
- Decommissioning and removal of Cape Horn Dam and associated facilities and features, except for limited components that will be needed for the NERF;
- Removal of NERF facilities and lands from the existing FERC License; and
- Restoration of the remnant inundation zone of Lake Pillsbury and Van Arsdale Reservoir.

The Proposed Action under the Application for Non-Project Use of Project lands (NPUPL Project Action) includes:

- Authorization for construction of the NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River, construction of a conduit from the pump station to the tunnel inlet and retaining wall and fill behind the retaining wall, and modification of the Potter Valley Powerhouse.

Table 1-1 (key process milestones) outlines the opportunities for public review of PG&E's Surrender Application.

Table 1-1. Key process milestones for development and submittal of the Surrender Application.

Milestone	Expected Date
Distribution of Initial Draft Surrender Application	November 17, 2023
Deadline for comments on Initial Draft Surrender Application	December 22, 2023
Distribution of Final Draft Surrender Application	January 31, 2025[3]
Deadline for comments on Final Draft Surrender Application	March 3, 2025
Consultation with resource agencies, Tribes, and others	March–July 2025 (estimated)
Filing and distribution of Final Surrender Application	July 29, 2025

PG&E released the Draft Surrender Application on January 31, 2025, to stakeholders (i.e., agencies, Tribes, non-governmental organizations, and interested public) for a 30-day review and comment period. Comments on the Draft Surrender Application will be considered in development of the Final Surrender Application, which will be filed with FERC in the same form and manner as an application for license.

The deadline to submit comments on the Draft Surrender Application is March 3, 2025. Electronic submittal of comments is encouraged. Please submit comments to:

Tony Gigliotti
Senior Licensing Project Manager
Power Generation
P.O. Box 28209
Oakland, CA 94604
E-mail: PVSurrender@pge.com

Information about PG&E's decommissioning process, including pertinent documents, are available at the following website: [https://www.pottervalleysurrenderproceeding.com/].

1.1 Background

On April 6, 2017, PG&E filed a notice of intent (NOI)[4] to prepare an application for a new license for the Project and a pre-application document (PAD) with FERC following the Integrated Licensing Process (ILP). PG&E later determined that it would be contrary to the best interests of its customers to continue relicensing the Project.

[3] FERC Accession Number 20250124-5123. This date differs from that included in PG&E's filing to FERC on June 6, 2024 (FERC Accession No. 20240606-5202), which stated that PG&E would distribute this document on January 25, 2025.

[4] FERC Accession Nos. 20170406-5314 (Public) and 20170406-5315 (Privileged).

On January 25, 2019, PG&E filed a notice of withdrawal of its NOI and PAD with FERC for the Project, stating that PG&E is (1) discontinuing its efforts to relicense the Project and (2) terminating its efforts to transfer or sell the Project.[5] In response to PG&E's notice of withdrawal, on March 1, 2019, FERC issued a notice soliciting applications[6] from any party interested in filing a license application for a new license for the Project, stating that applicants must first file an NOI and PAD.

On June 28, 2019, a group of acknowledged proxies for a new regional entity (hereafter referred to as the NOI Parties[7]) submitted an NOI to FERC identifying their intent to file an application for new license for the Project utilizing FERC's ILP.[8] On January 31, 2022, the NOI Parties submitted a letter to FERC indicating they had not established a new regional entity or accomplished the other tasks identified in their process plan and, as a result, would not file a final license application for the Project as required.[9]

Given FERC's solicitation did not result in a viable new applicant, on May 11, 2022, FERC directed PG&E to provide a plan and schedule for submitting a surrender application and decommissioning plan by July 11, 2022.[10] In response, PG&E filed a proposed plan and schedule on July 8, 2022.[11] The plan and schedule stated that PG&E would file the Surrender Application with FERC within 30 months after FERC approval of the proposed plan and schedule. FERC acknowledged and found PG&E's proposed plan and schedule acceptable on July 29, 2022.[12]

On November 17, 2023, PG&E issued an Initial Draft Surrender Application to regulatory agencies, Tribes, and other interested parties to solicit comments on PG&E's approach for decommissioning of the Project. Comments received on the Initial Draft Surrender Application were considered during the development of this Draft Surrender Application.

PG&E filed a revised schedule on June 6, 2024,[13] stating PG&E would file the Surrender Application with FERC by July 29, 2025. The revised schedule allowed time for PG&E to work with the Proponents and regulatory agencies to align the proposed action and resource protection measures and efficient regulatory process for the decommissioning of the Project and construction of the NERF. On July 1, 2024, FERC acknowledged PG&E's updated schedule and deemed it acceptable.[14] Therefore, the deadline for filing of the Surrender Application is July 29, 2025.

---

5 FERC Accession No. 20190125-5100.

6 FERC Accession No. 20190301-3038.

7 The NOI parties included Sonoma Water, Round Valley Indian Tribes, Mendocino County Inland Water and Power Commission, California Trout, and Humboldt County Public Works Department.

8 FERC Accession No. 20190628-5265.

9 FERC Accession No. 20220131-5223.

10 FERC Accession No. 20220511-3004.

11 FERC Accession No. 20220708-5267.

12 FERC Accession No. 20220729-3016.

13 FERC Accession No. 20240606-5202.

14 FERC Accession No. 20240701-3021.

1.2 Project Location and Overview

The Project is located on the Eel River and the East Branch Russian River in Mendocino and Lake counties, California. The Project is approximately 15 miles (mi.) northeast of the city of Ukiah. The majority of the Project is located on land owned by PG&E and National Forest System Lands administered by USFS, Mendocino National Forest. An overview of the major Project facilities and land jurisdictions in the vicinity of the Project are shown on Maps 1-1 and 1-2, respectively.

The uppermost portion of the 9.2-megawatt Project includes Scott Dam and the storage reservoir it impounds, Lake Pillsbury, on the Eel River. Below Scott Dam, the Eel River flows approximately 12 mi. to Van Arsdale Reservoir, created by Cape Horn Dam. Cape Horn Dam has fish passage facilities, enabling salmon, steelhead, and lamprey to access the Eel River and tributary streams between Cape Horn Dam and Scott Dam. There are no fish passage facilities at Scott Dam. At Van Arsdale Reservoir, diverted water is conveyed south by a series of tunnels, conduits, and penstocks to the Potter Valley Powerhouse, while water remaining in the Eel River is released from, or spills over, Cape Horn Dam where it flows northwest approximately 150 mi. to the Pacific Ocean. Releases made at Scott Dam and Cape Horn Dam support salmon and steelhead populations in the Eel River Watershed.

The Potter Valley Powerhouse is located in the upper Russian River Watershed, and releases from the powerhouse are a source of water in the East Branch Russian River and for local water users. The East Branch Russian River flows south from the Potter Valley Powerhouse (approximately 11 mi.[15]) and is impounded by the U.S. Army Corps of Engineers' (USACE's) Coyote Dam to form Lake Mendocino. Lake Mendocino is operated and managed by USACE for the purposes of flood control and water supply, in coordination with Sonoma Water and Mendocino County Russian River Flood Control and Water Conservation Improvement District. Water from Lake Mendocino is used in Mendocino and Sonoma counties for irrigation, municipal and domestic water supply, recreation, and support of salmon and steelhead populations in the Russian River. Water leaving Lake Mendocino joins with the mainstem Russian River and flows approximately 96 mi. to the Pacific Ocean near the town of Jenner. The Eel River and Russian River watersheds are depicted on Map 1-3.

To reduce the potential seismic risk, by letter dated May 22, 2023,[16] PG&E notified FERC that they are indefinitely imposing a reservoir restriction by keeping the spillway gates at Scott Dam open so that water cannot be impounded above the spillway elevation, thereby reducing water storage capacity in Lake Pillsbury by approximately 20,000 acre-feet (PG&E 2023). In an April 12, 2023, letter, Division of Safety of Dams (DSOD) concurred with PG&E's proposed reservoir restriction (DSOD 2023). During a routine inspection in July 2021, PG&E discovered a transformer at the Potter Valley Powerhouse that did not meet current operating standards. The powerhouse has been offline since that time. Based on the new reservoir restriction, PG&E has no plans to replace the transformer and return the Potter Valley Powerhouse to service. Currently, PG&E is diverting water from the Eel River to meet minimum instream flow requirements in the

[15] Potter Valley Powerhouse to the ordinary high water mark of Lake Mendocino (Coyote Dam spillway elevation at 764.8 feet above mean sea level).

[16] FERC Accession No. 20230523-5020.

East Branch Russian River and to meet water delivery contracts to the Potter Valley Irrigation District at the tailrace of the Potter Valley Powerhouse.

1.3 Project History

The Eel Power and Irrigation Company commenced construction of the Cape Horn diversion dam, intake, tunnels, and the Potter Valley Powerhouse in 1905. In 1908, construction of the initial Project works was completed by the company, which had been reorganized into the Snow Mountain Water and Power Company. In 1920, the Snow Mountain Water and Power Company applied to USFS for a final power permit for the construction of Scott Dam. During the same year, construction of the dam began, and a request was made to transfer the application for a final power permit to the Federal Power Commission (predecessor to the current FERC). The construction of Scott Dam was completed the following year.

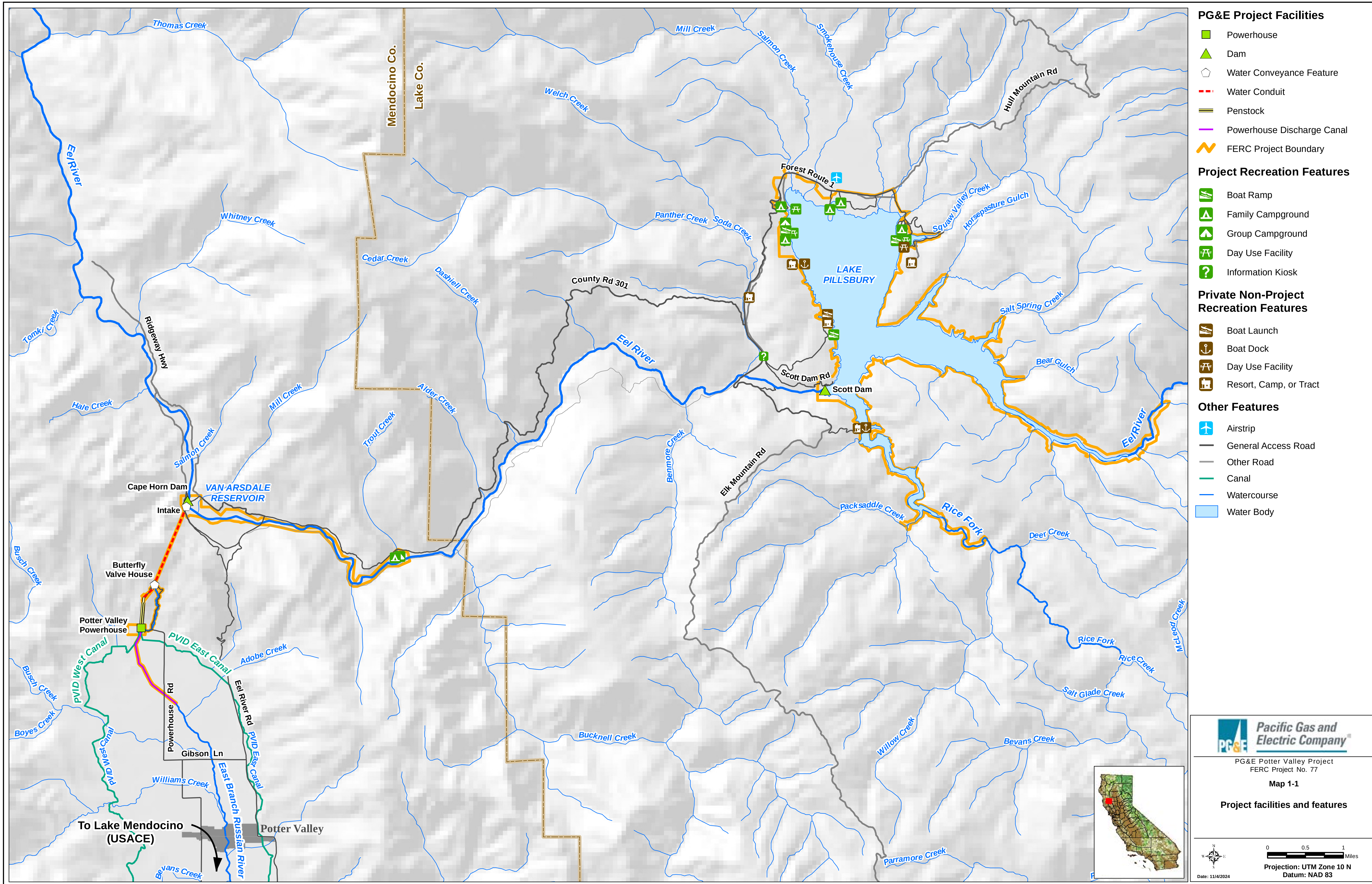
The Project was first licensed by the Federal Power Commission in 1922. The license was transferred to PG&E in 1930. The Project was relicensed by FERC in 1983. In 2004, FERC issued an Order Amending License for the Project that included a complex set of conditions to govern streamflows in both the Eel River and East Branch Russian River, as well as storage levels in Lake Pillsbury. Implementation of this order resulted in increased flows in the upper Eel River for the protection of salmon and steelhead populations, while reducing power generation output from the Project and the amount of water diverted to the East Branch Russian River. The license expired in 2022; the Project currently operates, and will continue to operate, under the annual license issued pursuant to 16 U.S. Code § 808(a)(1), which will renew automatically pursuant to the Commission's April 21, 2022,[17] Notice of Authorization for Continued Project Operation until the surrender and decommissioning proceeding is concluded.

1.4 References

FERC (Federal Energy Regulatory Commission). 1983. Opinion and order denying appeal, approving settlement, and issuing new license. October 4.

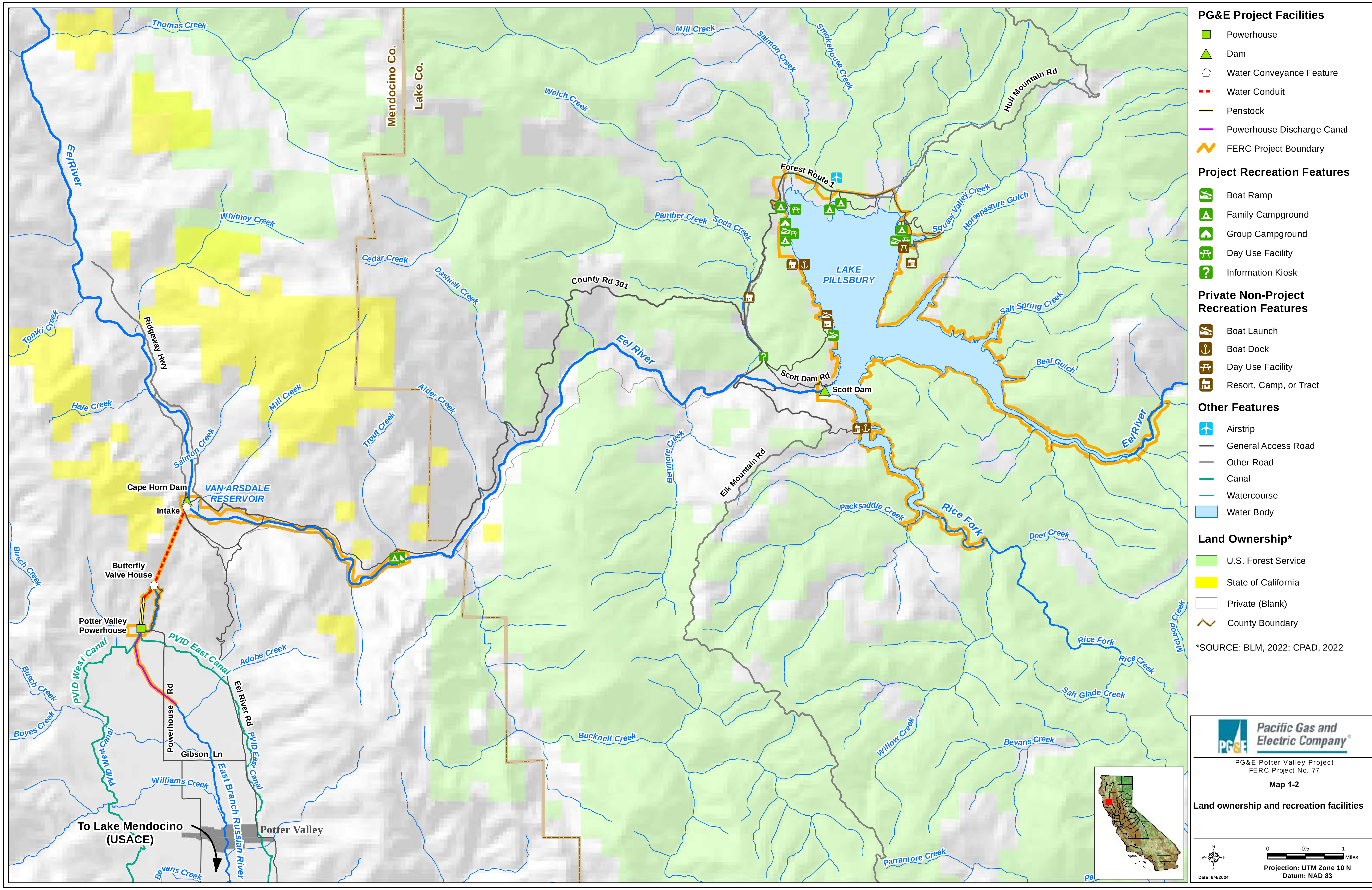
FERC (Federal Energy Regulatory Commission). 2004. Order amending license. January 28.

[17] FERC Accession No. 20220421-3034.



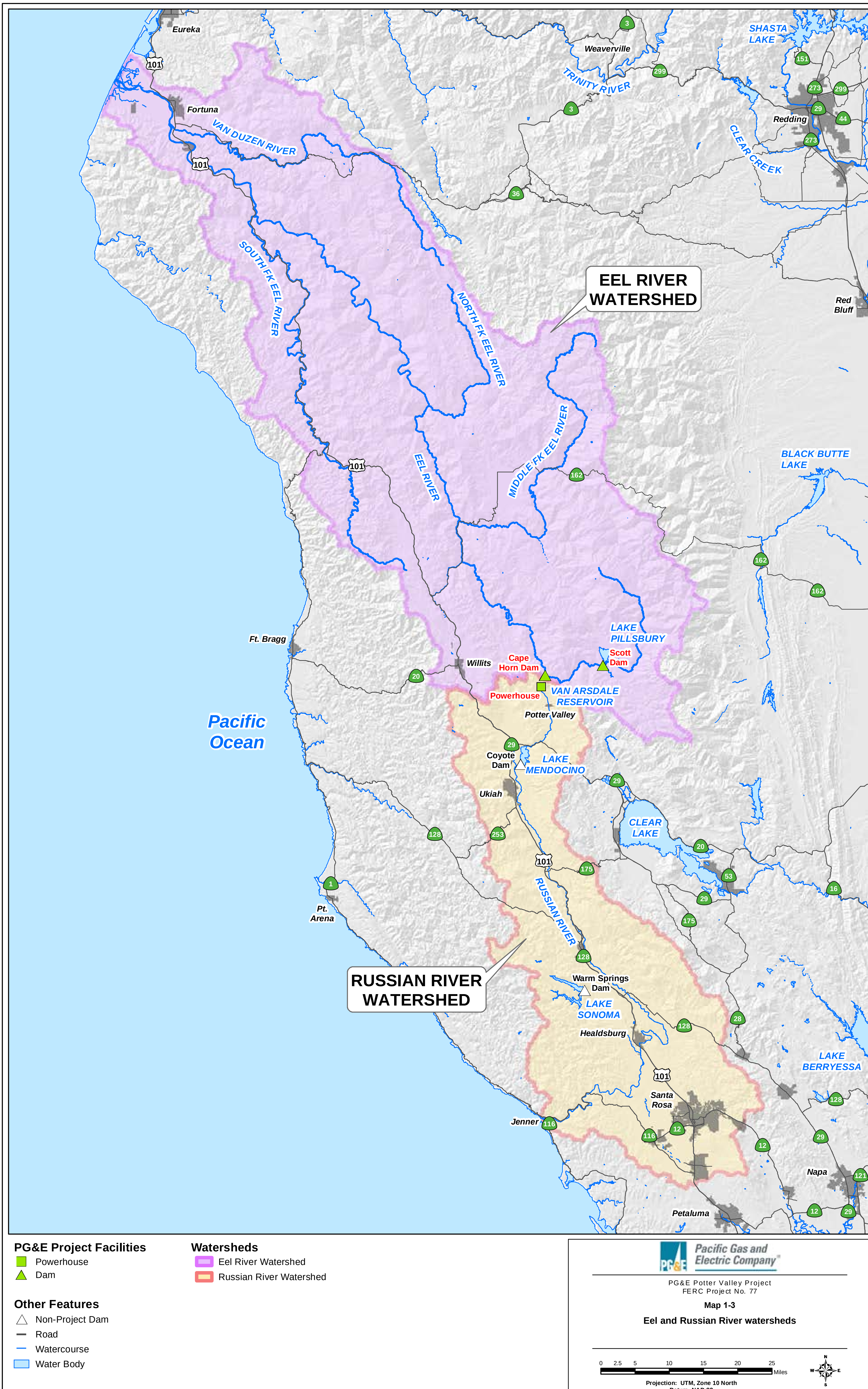
C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\CulturalMaps\Map 3.3.12-1 ProjectFacilities&Features_11i17i_10.mxd

This Page Intentionally Left Blank



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\PGE_PotterValley_Juris_17i11i_11.mxd

This Page Intentionally Left Blank



C:\GIS\185706343\03_data\gis_cad\map\PGE_PotterValley_Watersheds_11i17i_10.mxd

This Page Intentionally Left Blank

1.5 Contents of Surrender Application and Non-Project Use of Project Lands Application

This submittal includes PG&E's Project Surrender Application and an Application for Non-Project Use of Project Lands for FERC to authorize ERPA to construct the NERF while the license remains in effect, and it includes the following material:

- **Volume I** (Public Information) includes:
  - **Section 1** Introduction, provides Project background and history and the contents of this submittal to FERC
  - **Section 2** Purpose of the Action, describes the purpose and need for the Surrender Application and for PG&E's request for approval to grant ERPA permission to use Project lands and waters within the Project boundary for the construction of the NERF
  - **Section 3** Regulatory Framework for the Surrender Application and Application of Non-Project Use of Project Lands, provides a summary of regulations that are relevant to the Project
  - **Section 4** Consultation, provides a description of PG&E's consultation with stakeholders regarding decommissioning of Project facilities and surrender of the license
  - **Section 5** Proposed Action and Alternatives, provides an overview of the No-Action Alternative, PG&E's proposed decommissioning plan and restoration plan, and development of ERPA's NERF facility
  - **Section 6** Conclusions and Recommendations, provides the recommended alternative, unavoidable adverse impacts, recommendations of fish and wildlife agencies, and consistency with comprehensive plans
- **Volume II** includes Exhibit E (Public Information).

  The contents of this volume include PG&E's Proposed Action, including the conceptual decommissioning plan and restoration plan, and application for the non-Project use of Project lands. Exhibit E provides one description of the existing environment that characterizes the resources in the vicinity of the Project to understand where resources could potentially be affected by the Proposed Action, which includes both the application for license surrender and the application for the non-Project use of Project lands. The potential effects of implementation of PG&E's proposed decommissioning and restoration plans (Section 3.4) and ERPA's construction of components of the NERF (Section 3.5) are analyzed separately. Cumulative impacts are also evaluated separately for each application.

  Measures to protect environmental resources under FERC jurisdiction that may be affected during decommissioning and construction of the NERF and effects that cannot be avoided with implementation of the Project are also included in the Proposed Action (Section 2.2.3). This document includes short-term construction measures for the protection of resources during construction and post-facility removal measures. The details of these measures will be developed after PG&E's July 2025 filing of the Final Surrender Application with FERC. This document includes the goals of each resource protection measure and indicates any sub-measures, if applicable. An analysis of potential Project alternatives and conclusions and determinations are also provided.

- **Section 1** Introduction, presents the environmental analysis approach for Exhibit E and provides an overview of the Project location
- **Section 2** Proposed Action and Alternatives, describes the No-Action Alternatives and PG&E's proposal for the license surrender and non-Project use of Project lands.
- **Section 3** Environmental Analysis, includes the general description of the river basin, the affected environment for environmental and cultural resources, and the environmental effects of the Proposed Action under the license surrender and of the non-Project use of Project lands.

- **Volume III** includes non-public, privileged information and compiled data with regard to sensitive biological resources.
- **Volume IV** includes non-public, privileged information and compiled data with regard to pre-contact and historic-era archaeological resources, historic built-environment resources, and traditional cultural properties, as well as a record of consultation with Native American Tribes and agencies, as appropriate.

All portions of the Surrender Application and Application for Non-Project Use of Project Lands are public except for Volumes III and IV, which contain Controlled Unclassified Information and are filed with the Commission under the "privileged" security level. In accordance with the Commission's regulations at 18 CFR §§ 388.112 and 388.113, PG&E has included the required markings on each page of Volumes III and IV.

TABLE OF CONTENTS

List of Acronyms

ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
Sonoma Water	Sonoma County Water Agency
Surrender Application	Draft Surrender Application and Decommissioning Plan

This Page Intentionally Left Blank

2.0 PURPOSE OF ACTION

Pacific Gas and Electric Company (PG&E) is surrendering its license for the Potter Valley Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 77) (Project) because PG&E has determined that it would be contrary to the interests of its electric ratepayers to relicense the Project. The Project has been recognized by PG&E as uneconomic for PG&E's customers (i.e., the cost of production exceeds the cost of alternative sources of renewable power on the open market). FERC directed PG&E to provide a plan and schedule for submitting a Surrender Application and Decommissioning Plan (Surrender Application) by July 11, 2022 on May 11, 2022[1] (see Volume I, Section 1.1 for additional background information). PG&E's goals upon conclusion of the decommissioning process are to (1) remove the Project facilities and features including but not limited to Scott Dam and Cape Horn Dam, (2) remove the Project from FERC and Division of Safety of Dams jurisdiction; and (3) no longer operate or maintain the Project and Project features in the future.

This Surrender Application addresses the disposition of all Project facilities and has been developed in accordance with 18 Code of Federal Regulations Section (§) 6.1. As proposed, the license surrender and decommissioning of the Project will involve leaving certain facilities in place, removal of certain facilities with restoration, removal of certain facilities with no restoration, and the transfer of certain facilities to the Eel-Russian Project Authority[2] (ERPA) and other third parties.

Additionally, PG&E has been working with the Proponents[3] and regulatory agencies to align the Surrender Application and accompanying decommissioning plan with the interests of the Proponents for the construction and operation of the New Eel-Russian Facility (NERF) using some Project facilities for future diversion to the East Branch Russian River for water supply, water quality, and fish conservation in the Russian River basin.[4] This submittal, which includes a request for the authorization of a non-Project use of Project lands for the construction of certain components of the NERF and a request to remove NERF facilities and lands from the FERC license, reflects the agreement of these entities for meeting their interests.

PG&E is requesting FERC authorize, under License Article 5 of Form L-5 included in the FERC License Order Issued December 4, 1983 (FERC 1983) as Amended January 28, 2004 (FERC 2004), a non-Project of use of Project lands to allow ERPA to modify existing Project works and construct the NERF. The NERF, once constructed, will divert water from the Eel River to the existing Van Arsdale tunnel inlet and allow for future diversion to the East Branch Russian River. This submittal requests authorization for the construction of a new pump station, a conduit

1 FERC Accession No. 20220511-3004.

2 ERPA is a joint powers authority formed by a joint exercise of powers agreement between the County of Sonoma, Sonoma County Water Agency (Sonoma Water), and the Mendocino County Inland Water and Power Commission.

3 The Proponents consist of Sonoma Water, Mendocino County Inland Water and Power Commission, Humboldt County, Round Valley Indian Tribes, California Trout, Trout Unlimited, and California Department of Fish and Wildlife.

4 ERPA will complete separate environmental analyses and obtain separate permits and approvals for completing construction of the components of the NERF and for the operation of the facility by ERPA.

from the pump station to the tunnel inlet, and a retaining wall; and modifications to the Potter Valley Powerhouse. It is anticipated that construction of these components would be completed in the same season as PG&E's removal of Cape Horn Dam and associated Project facilities, except for limited components that will be needed for the NERF, when the Eel River in the vicinity of the dam is dewatered for PG&E's decommissioning activities. Therefore, the segment of the Eel River in the vicinity of Cape Horn Dam would only be dewatered once, thereby reducing potential adverse effects to water quality, aquatics, and other environmental resources that would have the potential to occur if the components of the NERF were to be constructed separately.

PG&E requests the Commission in the License Surrender Order to remove lands and works associated with the NERF from the license after specific milestones are met. ERPA will complete separate environmental analyses and obtain separate permits/approvals for completing construction of components of the NERF (Volume II, Section 2.2.2) and for the operation of the facility by ERPA, as described in Volume I, Section 3.2. Therefore, because operation of the NERF will occur after FERC's jurisdiction over these lands and works has ended, PG&E requests that FERC evaluate the NERF as a related project and analyze the cumulative effects of construction and operations.

Volume II, Exhibit E provides the information necessary for the Commission to evaluate potential effects on environmental resources from the Project license surrender and decommissioning. Exhibit E presents a description of all Project features (Section 2.1), the affected environment (Section 3.3), analysis of the environmental and economic effects of the Proposed Action and No-Action Alternative (Section 3.4), and description of measures to minimize or mitigate potential impacts (Section 2.2.3). Section 3.5 includes an evaluation of the potential effects of operations of the NERF on environmental resources. This submittal includes alternatives that were considered but were eliminated from further analysis (Volume I, Section 5.3), including phased Scott Dam removal and dam removal without construction of the NERF.

With filing of the Non-Project Use of Project Lands Application, PG&E requests that the Commission review and approve the proposed construction plan in Volume II, Section 2.2.2 of the NERF and modifications at Potter Valley Powerhouse for consistency with PG&E's license surrender and decommissioning plan for Cape Horn Dam. Volume II, Exhibit E of this submittal provides: (1) a description of the proposed non-Project use (Section 2.2.2); (2) a description of the affected environment in the immediate area surrounding the site of the proposed use (Section 3.3); (3) a description of the proposed project's impact on resources (Section 3.5); (4) a description of measures to minimize or mitigate potential impacts (Section 2.2.3); and (5) compatibility with decommissioning (Volume II, Section 2.2.2.2).

Documentation of consultation is provided in Volume I, Section 4.0.

2.1 References

FERC (Federal Energy Regulatory Commission). 2004. Order amending license. January 28.

FERC (Federal Energy Regulatory Commission). 1983. Opinion and order denying appeal, approving settlement, and issuing new license. October 4.

TABLE OF CONTENTS

List of Tables

List of Acronyms

CCA	Critical Coast Area
CDFA	California Department of Food and Agriculture
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DSOD	California Division of Dam Safety
EFH	Essential Fish Habitat
ERPA	Eel-River Project Authority
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FMP	Fishery Management Plan
FPA	Federal Power Act
HPMP	Historic Properties Management Plan
MMP	Marine Mammal Protection Act
mi.	mile(s)
MSA	Magnuson-Stevens Act
NERF	New Eel-Russian Facility
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SHPO	State Historic Preservation Officer
State Water Board	State Water Resources Control Board
Surrender Application	Draft Surrender Application and Decommissioning Plan
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Department of Agriculture – Forest Service
USFWS	U.S. Fish and Wildlife Service
W&SR	Wild and Scenic Rivers

3.0 STATUTORY AND REGULATORY FRAMEWORK

The Potter Valley Hydroelectric Project (Project) is currently operating under license issued by the Federal Energy Regulatory Commission (FERC) under the Federal Power Act (FPA).[1] The regulatory and statutory requirements applicable to PG&E's surrender and decommissioning of the Project are subject to the requirements under the FPA (16 United States Code [U.S.C.] § 791 et seq.) and other statutes and are summarized in Section 3.1.

As described in Volume I, Section 1.0, this submittal also requests the Commission to authorize non-Project use of Project lands to allow the Eel-Russian Project Authority (ERPA) to modify existing Project works and construction on Project lands within the FERC Project boundary. Section 3.2 provides a summary of the regulatory and statutory requirements to be obtained by ERPA for the construction and operation of the New Eel-Russian Facility (NERF).

3.1 License Surrender and Decommissioning

The major statutory and regulatory requirements and their status for the surrender and decommissioning of the Project are summarized in Table 3-1 and described below. Volume I, Section 4.0 provides a summary of PG&E's ongoing consultation with regulatory agencies and other stakeholders.

Table 3-1. Status of the major statutory and regulatory requirements for the surrender and decommissioning of the Potter Valley Hydroelectric Project.

Statute	Agency	Status
Section 6.2 of the Commission's Regulations	FERC	With the distribution of this Draft Surrender Application, PG&E seeks agency and stakeholder input on appropriate resources measures to be considered by PG&E and FERC as the Project is decommissioned. Comments on the Draft Surrender Application will be considered in development of the Final Surrender Application. PG&E will file and distribute the Final Surrender Application with FERC on July 29, 2025. PG&E will continue to consult with agencies and stakeholders throughout the FERC surrender process.
Clean Water Act	US Army Corps of Engineers (USACE)	PG&E will consult with the USACE throughout the FERC surrender process.

[1] Pacific Gas and Electric Company's (PG&E's) license for the Project expired on April 14, 2022. On April 21, 2022, FERC issued a notice authorizing PG&E to continue operating the Project under an annual license in accordance with the terms and conditions of PG&E's October 4, 1983, FERC license, as amended on January 28, 2004. On July 8, 2022, PG&E filed a plan and schedule to submit a license surrender application for the Project within 30 months of FERC's approval of the plan and schedule. FERC approved PG&E's plan and schedule on July 29, 2022.

Statute	Agency	Status
	State Water Resources Control Board (State Water Board)	PG&E will continue to consult with the State Water Board throughout the FERC surrender process.
Endangered Species Act	US Fish and Wildlife Service (USFWS); National Marine Fisheries Service (NMFS)	PG&E requested to be designated as the non-federal representative for the purpose of conducting Section 7 consultation for the Project on July 8, 2022, and was granted this request by FERC on July 29, 2022.[2] PG&E will continue to meet with the USFWS and NMFS throughout the FERC surrender process.
Coastal Zone Management Act	California Coastal Commission	PG&E will consult with the California Coastal Commission and will file documentation of this consultation with FERC.
National Historic Preservation Act	California State Historic Preservation Office	In a letter dated July 29, 2022,[3] FERC designated PG&E as its non-federal representative for the purpose of initiating and conducting consultation with the California State Historic Preservation Officer (SHPO), appropriate Tribes, and other consulting parties, pursuant to 36 CFR Part 800.2(c)(4) However, FERC remains ultimately responsible for all findings and determinations made pursuant to Sec 106 and is responsible for their government-to-government relationships with Native American Tribes. PG&E will continue to meet with the Tribes throughout the FERC surrender process.

3.1.1 Federal Power Act

FERC's regulations pertaining to the license surrender and termination of a licensed hydropower project are found in 18 Code of Federal Regulations (CFR) Chapter 1, Subchapter B, Part 6 – Surrender or Termination of License. Section 6.2 states the following:

> *Licenses may be surrendered only upon the fulfillment by the licensee of such obligations under the license as the Commission may prescribe, and, if the project works authorized under the license have been constructed in whole or in part, upon such conditions with respect to the disposition of such works as may be determined by the Commission. Where project works have been constructed on lands of the United States the licensee will be required to restore the lands to a condition satisfactory to the Department having supervision over such lands and annual charges will continue until such restoration has been satisfactorily completed.*

[2] FERC Accession No. 20220729-3016.

[3] FERC Accession No. 20220729-3016.

The conceptual decommissioning plan, and associated conceptual restoration plan, included in this Surrender Application will be more fully developed in consultation with the resource agencies and other interested parties as the surrender process proceeds. Select facilities and land areas associated with the Project are located on National Forest System land, managed by the U.S. Department of Agriculture (USDA) – Forest Service (USFS), Mendocino National Forest. Implementation of the decommissioning plan, and associated restoration plan will ensure that federal lands are adequately restored.

3.1.2 Section 18 Fishway Prescriptions

Section 18 of the FPA allows for federal fish agencies to prescribe fishways necessary to maintain all life stages of fish that could be affected by a project. The Project includes a fish ladder that allows fish to pass Cape Horn Dam. This fishway was constructed as prescribed by USFWS under Section 18 of the FPA. Section 18 will ensure that fish passage would be maintained during decommissioning. The fishway (referred to as the Cape Horn Dam Fish Ladder) and all associated features will be removed, as outlined in the Decommissioning Plan (Volume II, Section 2.2.1). The existing Fish Hotel and exclusion barrier will be modified to provide for unimpeded flow of water through the control section and provide fish passage through the control section (as part of the NERF construction). The Fish Attraction Facility (Fish Hotel and Exclusion Barrier) will either be removed or transferred to ERPA for the NERF and removed from the FERC license. The Cape Horn Dam Fish Ladder Rock Fall Fence will be transferred to ERPA.

3.1.3 Clean Water Act

Under Section 401(a)(1) of the CWA, every applicant for a federal permit or license for any activity that may result in a discharge to a water body must obtain State Water Quality Certification that the proposed activity will comply with state water quality standards. The State Water Board was designated by the U.S. Environmental Protection Agency as the water pollution control agency with authority to implement the CWA in California. California Water Code Section 13160; Title 23, California Code of Regulations Sections 3855-3861 - California Water Code Section 13160 designates the California State Water Board as the state water pollution control agency for the Federal Water Pollution Control Act and any other Federal act. Title 23, California Code of Regulations, Sections 3855-3861, specify requirements and procedures for applications for water quality certificates required under Federal law.

PG&E has met with the State Water Board (see Volume I, Section 4.0 Consultation), to discuss the Surrender Application and decommissioning plan, and will request a water quality certification in support of the decommissioning activities.

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into Waters of the United States, including wetlands. Activities in Waters of the United States regulated under this program include fill for development, water resource projects (e.g., dams, levees), infrastructure development (e.g., highways, airports), and mining projects. Section 404 requires a permit from the U.S. Army Corps of Engineers before dredged or fill material may be discharged into Waters of the United States unless the activity is exempt from Section 404 regulation (e.g., certain farming and forestry activities). Decommissioning of the Project will require a 404 permit with conditions that are designed to address and reduce potential effects to water resources, aquatic resources, and geology and soils.

Section 402 establishes the National Pollutant Discharge Elimination System (NPDES) permit program. This program regulates construction-related stormwater discharges to surface waters. PG&E will obtain and comply with the applicable NPDES permits during decommissioning activities.

3.1.4 Endangered Species Act / Magnuson-Stevens Fishery Conservation and Management Act / Marine Mammal Protection Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of designated critical habitat of such species. Critical habitats are areas that contain features essential to the conservation and recovery of an ESA-listed plant or animal that may require special management and protection. Critical habitat may include areas that are not currently occupied by the species but are considered necessary for recovery.

For marine species, the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries4 collaborate to list species and designate critical habitat.

The Magnuson-Stevens Fishery Conservation and Management Act governs fisheries management in the United States, including the designation of essential fish habitat (EFH). EFH has been designated in the Eel River, estuary, and nearshore area.

The Marine Mammal Protection Act (MMPA) enacted a national policy to protect populations of marine mammals from declining beyond the point at which they would not be able to function successfully within their environment. The MMPA prohibits, with some exceptions, the "take" (to harass, hunt, capture, kill, or attempt to harass, hunt, capture, or kill any marine mammal [16 U.S.C. 1362]) of marine mammals in U.S. waters. Some marine mammals with the potential to occur are protected under both the MMPA and ESA.

PG&E requested to be designated as the non-federal representative for the purpose of conducting consultation under Section 7 of the ESA, as amended, and the joint agency regulations thereunder at 50 CFR Part 402, Section 305(b), of the Magnuson-Stevens Fishery Conservation and Management Act and the implementing regulations at 50 CFR Section 600.920 with USFWS and NMFS on July 8, 2022. FERC granted PG&E's request on July 29, 2022.

PG&E has met with USFWS and NMFS (see Volume I, Section 4.0 Consultation), to discuss the Surrender Application and decommissioning plan, and will continue to coordinate with these agencies on measures to address potential effects to listed species and critical habitats.

---

[4] Also known as the National Marine Fisheries Service (NMFS).

3.1.5 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) provides for the management of the nation's coastal resources and is administered by the NOAA. If a project is located within a coastal zone boundary or if a project affects a resource located in the boundaries of the designated coastal zone, the applicant must certify that the project is consistent with the state Coastal Zone Management Program. In California, the Federal Consistency Unit of the California Coastal Commission implements the federal CZMA as it applies to federal activities, development projects, permits and licenses, and support to state and local governments.

The Project is not located within a coastal zone boundary that is protected under the CZMA. However, the Eel River drains into the Pacific Ocean approximately 150 miles (mi.) downstream of Cape Horn Dam, through the Eel River Delta, which is designated as a critical coast area (CCA) under the National Coastal Zone Management Program. According to the Eel River CCA Fact Sheet, hydromodification (e.g., flow alteration/regulation/modification, channel erosion, and streambank modification/destabilization) may affect water quality in this CCA (California Coastal Commission 2019). Despite the distance between the Project and the designated CCA, license surrender and decommissioning of the Project may require California coastal zone program review and a coastal zone consistency certification.

3.1.6 National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966 establishes the role and responsibilities of the federal government in historic preservation. Toward this end, the NHPA directs agencies to (1) identify and manage historic properties under their control; (2) undertake actions that will advance the act's provisions and avoid actions contrary to its purposes; (3) consult with others while carrying out historic preservation activities; and (4) consider the effects of their actions on historic properties.

Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on potential effects. The regulations that implement Section 106 and outline the historic preservation review process are provided at 36 CFR Part 800.

The Proposed Action to decommission the Project qualifies as an "undertaking," as defined at 36 CFR Part 800.16(y), and has the potential to affect historic properties (36 CFR Part 800.3[a]); therefore, FERC must address Section 106 of NHPA by taking into account the effect of the undertaking on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places.

In a letter dated July 8, 2022, in accordance with 36 CFR § 800.2(c)(4), PG&E requested that FERC authorize PG&E to initiate consultation on behalf of FERC with the California State Historic Preservation Officer (SHPO) and others regarding the decommissioning of the Project. In response, FERC designated PG&E as a non-federal representative for the purposes of conducting Section 106 consultation under the NHPA on July 29, 2022.

To ensure that the license surrender and decommissioning of the Project does not adversely affect properties listed or eligible for listing in the National Register of Historic Places, PG&E will develop a management plan according to the Section 106 process such as a Programmatic Agreement and/or Historic Properties Management Plan that will include additional studies to identify effects and measures to avoid or mitigate adverse effects to cultural and Tribal resources. The plan will incorporate results from cultural and Tribal resource studies as well as concurrence on eligibility received from the SHPO. The plan will be reviewed in consultation with FERC, SHPO, Tribes, and stakeholders and will outline implementation procedures such as management roles and responsibilities, Tribal and agency consultation, review requirements, implementation protocols, monitoring, as well as processes for revision of the plan and dispute resolution.

3.1.7 Wild and Scenic Rivers Act

Section 7(a) of the Wild and Scenic Rivers Act requires federal agencies to make a determination as to whether the operation of the Project under a new license will invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in a designated river corridor.

None of the Project facilities are located on river segments identified as eligible or suitable for inclusion in the National Wild and Scenic Rivers (W&SR) System. However, the Eel River from 100 yards (300 feet) downstream of Van Arsdale Dam to its mouth and its four main tributaries (North Fork, South Fork, Middle Fork, and Van Duzen rivers) are designated as national wild and scenic rivers. The Eel River and its tributaries were included in the National WS&R System in 1981 and together include 97 mi. of river that are classified as “wild,” 28 mi. of river classified as “scenic,” and 273 mi. of river classified as “recreational” (National W&SR System n.d.). These segments are managed by Bureau of Land Management, California Resources Agency, Round Valley Indian Reservation, and USFS, depending upon jurisdiction.

The segments of the Eel River and its tributaries that are included in the National W&SR System are also included in the California W&SR System and are protected under the California Wild and Scenic Rivers Act (Public Resources Code §§ 5093.50-5093.70).

3.1.8 California Environmental Quality Act

The California Environmental Quality Act (CEQA) applies to all discretionary projects proposed to be conducted or approved by a California public agency. For the Proposed Action, the State Water Board is the Lead Agency for CEQA compliance.

3.1.9 FERC Dam Safety

The engineering designs for removal of Scott Dam and Cape Horn Dam demonstrating that safety requirements are met will be approved by FERC Dam Safety prior to initiation of dam removal activities.

3.1.10 California Division of Dam Safety

Under California Water Code, Part 1 and 3 of Division 3, Part 1, Chapter 5, Applications, Section 6225-6230 requires PG&E to seek approval from the California Division of Dam Safety (DSOD) for the removal of Scott Dam and Cape Horn Dam. PG&E will submit an application to DSOD for approval. The application will include plans, drawings and specifications that will demonstrate that DSOD dam safety standards have been met.

3.2 Non-Project Use of Project Lands

Excepting PG&E's request to FERC to permit non-Project use of Project lands, ERPA will be responsible to apply for, secure, and hold all regulatory permits required for NERF. These permits will cover construction, operation, and maintenance. Table 3-2 is a summary of such permits.

Table 3-2. Summary of permits required for the New Eel-Russian Facility.

Permit	Regulatory Agency	Applicant	Purpose
Authorization for Non-Project Use of Project Lands	FERC	PG&E	License surrender application will ask FERC to approve NERF construction as non-Project use of lands, such that construction is consistent with PG&E's decommissioning work at Cape Horn Dam.
Clean Water Act Section 404	USACE	ERPA	Regulate dredge and fill for NERF construction, as well as operation and maintenance. ERPA has begun discussions with USACE about this scope and specifically whether a separate permit for construction and operation may be required.
Endangered Species Act Section 7(a) Biological Opinion	NMFS, USFWS, USACE	ERPA	Aquatic and terrestrial federal endangered species protection for NERF construction, as well as operation, and maintenance, as related to USACE 404 Permit. ERPA has begun discussions with NMFS about this scope and specifically whether separate biological opinions for construction and operation may be required.
Clean Water Act Section 401 (a)	State Water Board	ERPA	Ensure state water quality standards are met for NERF construction, as well as operation, and maintenance. This certification relates to the USACE 404 permit. ERPA has begun discussions with the State Water Board about this scope and specifically whether a separate permit for construction and operation may be required.

Permit	Regulatory Agency	Applicant	Purpose
Construction General Permit, National Pollution Discharge Elimination System (NPDES) – Clean Water Act Section 402	State Water Board	ERPA	Ensure compliance with water quality and erosion control standards during NERF construction.
CA Fish and Game Code Section 1600 Streambed Alteration Agreement	CA Dept. Fish and Wildlife	ERPA	Aquatic species and riparian habitat protection for NERF construction, operations and maintenance.

3.3 References

California Coastal Commission. 2019. Eel River Critical Coastal Area. Available at: https://documents.coastal.ca.gov/assets/water-quality/ccc-factsheets/North-Coast/CCA%206%20Eel%20River%20Factsheet%2012-16-19.pdf.

National W&SR System. n.d. National Wild and Scenic Rivers System. Available at: www.rivers.gov.

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Acronyms

ACHP	Advisory Council on Historic Preservation
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
ERPA	Eel-Russian Project Authority
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SHPO	State Historic Preservation Officer
Surrender Application	Surrender Application and Decommissioning Plan
SWB	California State Water Resources Control Board
USFS	US Forest Service
USFWS	US Fish and Wildlife Service

4.0 CONSULTATION

This section describes Pacific Gas and Electric Company's (PG&E's) consultation efforts completed during the surrender application process for the Potter Valley Hydroelectric Project (Project). Documents referred to in this section are available by link on either the Project relicensing website at the Potter Valley Surrender Application Project website and the Federal Energy Regulatory Commission's (FERC's) eLibrary at www.ferc.gov/docs-filing/elibrary.asp under Docket P-77.

4.1 Initial Draft Surrender Application Development and Distribution

On May 11, 2022, FERC directed PG&E to provide a plan and schedule for submitting a Surrender Application and Decommissioning Plan (Surrender Application) by July 11, 2022.[1] In response, PG&E timely filed a proposed plan and schedule on July 8, 2022.[2] The plan and schedule stated that PG&E would file a Surrender Application with FERC within 30 months after FERC approval of the proposed plan and schedule. FERC acknowledged and found PG&E's proposed plan and schedule acceptable on July 29, 2022.[3]

In July 2023 PG&E received a proposal from the California Department of Fish and Wildlife (CDFW), California Trout, Humboldt County, the Mendocino County Inland Water and Power Commission, the Round Valley Indian Tribes, the Sonoma County Water Agency, and Trout Unlimited (collectively referred to as the Proponents) for Project facilities in the Cape Horn Dam Area. The new facility is called the "New Eel-Russian Facility" (NERF). A Regional Entity (Eel-Russian Project Authority [ERPA]) was formed that is responsible for modifications at the former Cape Horn Dam site and Van Arsdale Intake to construct the NERF. This Regional Entity is governed by a board comprised of the County of Sonoma, Sonoma County Water Agency, Mendocino County Inland Water and Power Commission, and Round Valley Indian Tribes. A preliminary description of the Regional Entity's proposed modifications was provided in Subsections 4.3.1.2 and 4.3.1.3 of the Initial Draft Surrender Application that was subject to further design development and stakeholder input throughout the Draft Surrender Application process.

An Initial Draft Surrender Application was prepared and distributed to Tribes, regulatory agencies, and other interested parties on November 17, 2023. This Initial Draft Application included a description of the existing Project, reason for the license surrender, and a description of PG&E's Conceptual Decommissioning Plan. PG&E received comments from Tribes, regulatory agencies, and other interested parties on the Initial Draft Surrender Application and ERPA's proposed modifications. These comments were reviewed and considered during development of the Draft Surrender Application.

1 FERC Accession No. 20220511-3004.
2 FERC Accession No. 20220708-5267.
3 FERC Accession No. 20220729-3016.

4.2 Final Draft Surrender Application Development and Distribution

This Final Draft Surrender Application (Draft Surrender Application) was developed in coordination with PG&E and stakeholders and includes an environmental analysis (Exhibit E) to describe the environmental resources present in the Project Area, the potential effects to resources from dam and facility removal, and measures to reduce effects to resources.

In late 2023, PG&E initiated early outreach activities that involved phone calls with individual state and federal resource agencies and conducting meetings with stakeholders including resource agencies, and Tribes. The intent of early outreach activities was to identify potential stakeholders and understand their resource interests, provide information related to the FERC surrender process, describe Project facilities and operations, and solicit existing resource information.

On May 31, 2024, PG&E sent a letter to all interested parties with notification of the extension for time request for the submission of documents to FERC. On June 6, 2024, PG&E submitted to FERC an Extension of Time request for the Draft Surrender Application as well as the Final Surrender Application and Decommissioning Plan. PG&E proposed the Draft Surrender Application be available for comment in January 2025 instead of June 2024 as detailed in the plan and schedule approved by FERC on July 29, 2022. PG&E also proposed the Final Surrender Application and Decommissioning Plan be submitted to FERC by July 29, 2025 (previously January 2025). On July 1, 2024, FERC filed an acknowledgment and acceptance of PG&E's revised schedule.

PG&E, the Proponents, and others have formed a steering committee to bring the interests of PG&E and the Proponents into one agreement that aligns with PG&E's Surrender Application and accompanying Potter Valley Decommissioning Plan. PG&E has worked with the Proponents and regulatory agencies to align the Proposed Action and an efficient regulatory process for the decommissioning of the Project and construction of the NERF.

This Draft Surrender Application also includes a request that FERC authorize non-Project use of Project lands under License Article 5 of Form L-5 included in the FERC License Order Issued December 4, 1983 (FERC 1983), as Amended January 28, 2004 (FERC 2004). Specifically, PG&E requests authorization to allow ERPA to construct the NERF on lands within the FERC Project boundary. This application only requests authorization for construction of the new NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River, retaining wall, and modification of the Potter Valley Powerhouse. Separate environmental analysis and permits/approvals will be required for completing construction of the NERF and for the operation of the facility by ERPA.

On January 31, 2025, this Draft Surrender Application was distributed to all persons on the distribution list (see Table 4-A-1 in Appendix 4-A) and was published in the Potter Valley Surrender Application Project website. PG&E will solicit comments from Tribes, regulatory agencies, and other interested parties on the Draft Surrender Application and Application for Non-Project Use of Project Lands during a 30-day review and comment period. Comments on the Draft Surrender Application will be considered in development of the Final Surrender Application and

Decommissioning Plan that will be filed with FERC in the same form and manner as an application for license.

4.3 Final Surrender Application Development and Distribution

This section to be included in the Final Surrender Application and Decommissioning Plan.

PG&E will submit the Final Surrender Application and Decommissioning Plan to FERC by July 29, 2025.

4.4 Summary of Agency Consultation

Table 4-A-1 in Appendix 4-A identifies the name and address of every federal, state, and interstate resource agency, Native American Tribe, or member of the public that PG&E consulted during preparation of this Draft Application for Surrender of License and Application for Non-Project Use of Project Lands for the Project.

Table 4-1 provides a brief description of consultation to date, including a list of meeting dates with interested resource agencies and other interested parties. PG&E consulted with resources agencies via email letters, virtual meetings, and in-person meetings. Meeting notices were provided prior to each meeting.

In addition, beginning in late 2023, PG&E held virtual and in-person meetings and continues to meet with various resource agencies and stakeholders, including the California State Water Resources Control Board (SWB), the National Marine Fisheries Service (NMFS), the US Forest Service (USFS), the US Fish and Wildlife Service (USFWS), Lake County, recreation-based non-governmental organizations, and the steering committee.

Table 4-1. Resource agency and stakeholder meetings.

Date	Method	Entities	Summary
November 17, 2023	Email	Stakeholders	PG&E distributed the Initial Draft Surrender Application for 35-day review and comment.
January 18, 2024	Virtual/In-person Meeting	USFWS, NFMS, USFS, SWB, CDFW	PG&E met with agencies and Tribal representatives to provide an overview of the Project and PG&E goals, discuss the surrender process and schedule, provide updates to the application, provide stakeholder comments received, and solicit input on the proposed Project and alternatives.
February 15, 2024	Virtual/In-person Meeting	USFWS, NFMS, USFS, SWB, CDFW	PG&E met with federal and state agencies and interested Tribal representatives to provide information on the Surrender Application's development, level of detail, and resource interests.
February 28, 2024	Virtual Meeting	SWB	PG&E met with SWB to discuss the preliminary list of studies and information to support the SA.

Date	Method	Entities	Summary
February 28, 2024	Virtual/In-person	SWB	PG&E met with the SWB to provide information on the Surrender Application's process and schedule. The SWB provided a list of preliminary information needs and discussed the timing of the 401 certification.
May 6, 2024	Virtual	SWB	PG&E met with the SWB to provide an update to the Surrender Application.
June 26, 2024	Virtual	Lake County	PG&E met with Lake County to provide an update to the Surrender Application and receive feedback
July 2, 2024	Virtual	SWB	PG&E met with the SWB to discuss the 401 process and the SWB's data/study request.
August 12, 2024	In-Person	Lake County	PG&E met with Lake County to provide an update to the Surrender Application and receive feedback.
August 27, 2024	Virtual	SWB	PG&E met with the SWB to provide information on the Surrender Application's development and project updates.
September 9, 2024	Virtual/In-person Meeting	USFS, NPS, SWB, CDFW, Tribes, Lake County, Stakeholders	PG&E hosted technical outreach meetings for specific environmental resources to provide an update on PG&E's application including the Surrender Application process, Project timeline, and application content; effects analysis approach; and potential effects and proposed environmental measures.
September 10, 2024	Virtual/In-person Meeting	USFWS, NFMS, USFS, SWB, CDFW	PG&E hosted technical outreach meetings for specific environmental resources to provide an update on PG&E's application including the Surrender Application process, Project timeline, and application content; effects analysis approach; and potential effects and proposed environmental measures.
October 10, 2024	Virtual	NMFS	PG&E met to provide information on the Surrender Application's development and provided project status updates.
October 15, 2024	Virtual	Lake County	PG&E met with Lake County to provide an update to the Surrender Application and receive feedback
October 16, 2024	Virtual	NMFS	PG&E met to provide information on the Surrender Application's development, level of detail, and project updates.
October 24, 2024	Virtual	USFS, Lake County	PG&E met with USFS and Lake County to discuss fire suppression.
November 5, 2024	Virtual	CalWild	CalWild provided background information on recreation near Lake Pillsbury.

Date	Method	Entities	Summary
November 12, 2024	Virtual	NGOs	PG&E met to provide information on the Surrender Application's development, level of detail, and resource interests. Attendees included CalTrout, Sierra Club, Friends of the Eel, Save California Salmon, CalWild, American Whitewater, Pacific Coast Federation of Fisherman, and California Sportfishing Protection Alliance.
November 19, 2024	Virtual	NMFS	PG&E met to provide information on the Surrender Application's development and provided project status updates.
December 20, 2024	Virtual	SWB	PG&E met to provide information on the Surrender Application's development and provided project status updates.

4.5 Endangered Species Act Section 7 Consultation

Pursuant to Section 7 of the federal Endangered Species Act (ESA), consultation with USFWS is required when implementation of a project may affect the continued existence of a federally listed species. Species are defined as threatened or endangered by USFWS if they are listed in Title 50 of the Code of Federal Regulations (CFR) (§ 17.11 or 17.12). PG&E requested to be designated as the non-federal representative for the purpose of conducting consultation under Section 7 of the ESA, as amended, and the joint agency regulations thereunder at 50 CFR Part 402, Section 305(b), of the Magnuson-Stevens Fishery Conservation and Management Act and the implementing regulations at 50 CFR Section 600.920 with USFWS and NMFS on July 8, 2022. FERC granted PG&E's request on July 29, 2022.[4]

4.6 National Historic Preservation Act Section 106 Consultation[5]

The National Historic Preservation Act (NHPA) of 1966 establishes the role and responsibilities of the federal government in historic preservation. Toward this end, the NHPA directs agencies to (1) identify and manage historic properties under their control; (2) undertake actions that will advance the act's provisions and avoid actions contrary to its purposes; (3) consult with others while carrying out historic preservation activities; and (4) consider the effects of their actions on historic properties.

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on potential effects. The regulations that implement Section 106 and outline the historic preservation review process are provided at 36 CFR Part 800.

4 FERC Accession No. 20220729-3016.

5 As of the date of this Surrender Application, formal consultation pursuant to Sec 106 of the NHPA has not been initiated.

The Proposed Action to decommission the Project qualifies as an "undertaking," as defined at 36 CFR Part 800.16(y), and has the potential to affect historic properties (36 CFR Part 800.3[a]); therefore, FERC must address Section 106 of NHPA by taking into account the effect of the undertaking on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP).

In a letter dated July 29, 2022,[6] FERC designated PG&E as its non-federal representative for the purpose of initiating and conducting consultation with the California State Historic Preservation Officer (SHPO), appropriate Tribes, and other consulting parties, pursuant to 36 CFR. Part 800.2(c)(4). However, FERC remains ultimately responsible for all findings and determinations made pursuant to Sec 106 and responsible for their government-to-government relationships with Native American Tribes.

4.6.1 Summary of Tribal Consultation

PG&E distributed the Initial Draft Surrender Application to the following Tribes:

1. Big Valley Rancheria of Pomo Indians
2. Cahto Tribe
3. Coyote Valley Band of Pomo Indians
4. Elem Indian Colony of Pomo Indians
5. Guidiville Rancheria of California
6. Habematolel Pomo of Upper Lake
7. Hopland Band of Pomo Indians
8. InterTribal Sinkyone Wilderness Council
9. Kashia Band of Pomo Indians of the Stewarts Point Rancheria
10. Lower Lake Rancheria
11. Manchester-Point Arena Rancheria
12. Middletown Rancheria
13. Mishewal Wappo of Alexander Valley
14. Noyo River Indian Community
15. Pinoleville Pomo Nation
16. Potter Valley Tribe
17. Redwood Valley Rancheria of Pomo
18. Robinson Rancheria Band of Pomo Indians
19. Round Valley Indian Tribes

6 FERC Accession No. 20220729-3016.

20. Scotts Valley Band of Pomo Indians
21. Shebelna Band of Mendocino Coast Pomo Indians
22. Sherwood Valley Rancheria Band of Pomo Indians
23. Wailaki Tribe
24. Wiyot Tribe
25. Yuki/Wailaki

Additional Tribes were identified during development of the Draft Surrender Application. The Tribes identified that may be affected by, or have an interest in, the Project are listed in Table 4-A-1 in Appendix 4-A.

A record of communications and events that have occurred with Tribes during the Surrender Application process is provided in Table 4-2.

Table 4-2. Tribal outreach activities.

Date	Type / Purpose
November 17, 2023	PG&E distributed an Initial Draft Surrender Application in November 2023 to Tribes and stakeholders.
January 18, 2024	PG&E met with agencies and Tribal representatives to provide an overview of the Project and PG&E goals, discuss the surrender process and schedule, provide updates to the application, provide stakeholder comments received, and solicit input on the proposed Project and alternatives.
February 14, 2024	PG&E met with interested Tribal representatives and members to provide an overview of the Initial Draft Surrender Application and Decommissioning Plan and the license surrender process.
February 15, 2024	PG&E hosted a meeting to discuss the development of the Draft Surrender Application and Conceptual Decommissioning Plan.
March 2024–September 2024	PG&E refined development of the Project description and identified study areas for environmental and cultural and Tribal resources.
May 31, 2024	PG&E sent a letter to all interested parties informing them of the extension for time request for the Final Draft SA to be submitted to FERC in January 2025 and the Final SA to be submitted to FERC in July 2025.
September 9, 2024	PG&E hosted a technical outreach meeting to provide an update on PG&E's application including the Surrender Application process, Project timeline, and application content; effects analysis approach; and potential effects and proposed environmental protection measures.
September 11, 2024	Received Native American contacts and information on whether any sacred land files were present for the Tribal study area from the Native American Heritage Commission.
October 11, 2024	PG&E sent letter to additional Tribes identified by the Native American Heritage Commission describing the Project, Cultural and Tribal Study Areas, summary of surrender application outreach activities and timeline moving forward.

4.7 References

FERC (Federal Energy Regulatory Commission). 2004. Order Amending License. January 28

FERC (Federal Energy Regulatory Commission). 1983. Opinion and Order Denying Appeal, Approving Settlement, and Issuing New License. October 4.

Appendix 4-A

Distribution List

This Page Intentionally Left Blank

The master distribution list (Table 4-A-1) provides email addresses for all entities as available (private emails are not provided) and street addresses otherwise.

Table 4-A-1. Parties consulted in the preparation of this Surrender Application.

Organization	Name	Email or Street Address
Federal Energy Regulatory Commission		
Federal Energy Regulatory Commission	Timothy Konnert	timothy.konnert@ferc.gov
PG&E Staff		
PG&E	PG&E	PG&E
PG&E-Retired	PG&E-Retired	PG&E-Retired
PG&E-Retired	PG&E-Retired	PG&E-Retired
Federal Government / Representatives		
Congressional Representative Office	Jenny Callaway	jenny.callaway@mail.house.gov
Congressional Representative Office	John Driscoll	john.driscoll@mail.house.gov
Environmental Protection Agency	Will Duncan	duncan.will@epa.gov
National Marine Fisheries Service	Alecia Van Atta	alecia.vanatta@noaa.gov
National Marine Fisheries Service	Andres Ticlavilca	andres.ticlavilca@noaa.gov
National Marine Fisheries Service	Bob Coey	bob.coey@noaa.gov
National Marine Fisheries Service	Clarence Hostler	clarence.hostler@noaa.gov
National Marine Fisheries Service	Dan Wilson	dan.wilson@noaa.gov
National Marine Fisheries Service	David Boughton	david.boughton@noaa.gov
National Marine Fisheries Service	David White	david.k.white@noaa.gov
National Marine Fisheries Service	Irma Lagomarsino	irma.lagomarsino@noaa.gov
National Marine Fisheries Service	Jeffrey Jahn	jeffrey.jahn@noaa.gov
National Marine Fisheries Service	Josh Fuller	joshua.fuller@noaa.gov
National Marine Fisheries Service	Julie Weeder	julie.weeder@noaa.gov
National Marine Fisheries Service	Matt Goldsworthy	matt.goldsworthy@noaa.gov
National Marine Fisheries Service	Nate Mantua	nate.mantua@noaa.gov
National Marine Fisheries Service	Nicholas Easterbrook	nicholas.easterbrook@noaa.gov
National Marine Fisheries Service	Ruth Goodfield	ruth.goodfield@noaa.gov
National Marine Fisheries Service	Steve Edmondson	Steve.Edmondson@noaa.gov
National Marine Fisheries Service	Tom Holley	thomas.holley@noaa.gov
National Marine Fisheries Service	William Foster	william.foster@noaa.gov
National Park Service	Barbara Rice	barbara_rice@nps.gov

Organization	Name	Email or Street Address
National Park Service	Catherine Brown	catherine_brown@nps.gov
National Park Service	Harry Williamson	hbwillia44@gmail.com
National Park Service	Susan Rosebrough	susan_rosebrough@nps.gov
National Park Service (Contractor)	Lil Jonas	ljonas@frontiernet.net; lilian_jonas@contractor.nps.gov
NRCS-USDA	Erin Kile	erin.kile@ca.usda.gov; erinof@jps.net
US Army Corps of Engineers	Wade L. Eakle	Wade.L.Eakle@usace.army.mil
US Bureau of Land Management	David Fuller	dfuller@blm.gov
US Bureau of Land Management	Zane Ruddy	jruddy@blm.gov
US Dept. of Agriculture	Gaylen Allen	gaylen.allen@usda.gov
US Dept. of Agriculture	Jonathan Shultz	jon.shultz@ca.usda.gov
US Fish and Wildlife Service	Josh Boyce	josh_boyce@fws.gov
US Fish and Wildlife Service	Stephanie Millsap	stephanie_millsap@fws.gov
US Forest Service	Dawn Alvarez	dawn.alvarez@usda.gov
US Forest Service	Frank Aebly	frank.aebly@usda.gov
US Forest Service	Joshua Abel	Joshua.Abel@usda.gov
USFS Mendocino National Forest	Wade McMaster	825 N. Humboldt Ave. Willows, CA 95988
US House of Representatives	Mike Thompson	268 Cannon Office Building Washington, DC 20515
State Government / Representatives		
California Department of Fish and Wildlife	Adam McKannay	adam.mckannay@wildlife.ca.gov
California Department of Fish and Wildlife	Allan Renger	allan.renger@wildlife.ca.gov
California Department of Fish and Wildlife	Brett Kormos	Brett.Kormos@wildlife.ca.gov
California Department of Fish and Wildlife	Curtis Milliron	curtis.milliron@wildlife.ca.gov
California Department of Fish and Wildlife	Chris Ramsey	Chris.Ramsey@wildlife.ca.gov
California Department of Fish and Wildlife	Dave Kajtaniak	david.kajtaniak@wildlife.ca.gov
California Department of Fish and Wildlife	David Hines	David.hines@wildlife.ca.gov
California Department of Fish and Wildlife	Davis Ferguson	Davis.Ferguson@Wildlife.ca.gov

Organization	Name	Email or Street Address
California Department of Fish and Wildlife	Erin Chappell	Erin.Chappell@Wildlife.ca.gov
California Department of Fish and Wildlife	Jonathon Mann	jonathon.mann@wildlife.ca.gov
California Department of Fish and Wildlife	Joshua Bush	joshua.bush@wildlife.ca.gov
California Department of Fish and Wildlife	Matt Myers	matt.myers@wildlife.ca.gov
California Department of Fish and Wildlife	Robert Hughes	robert.hughes@wildlife.ca.gov
California Department of Fish and Wildlife	Scott Bauer	scott.bauer@wildlife.ca.gov
California Department of Fish and Wildlife	Scott Harris	scott.harris@wildlife.ca.gov
California Department of Fish and Wildlife	Scott Monday	scott.monday@wildlife.ca.gov
California Department of Fish and Wildlife	Shahid Anwar	mohammed.anwar@wildlife.ca.gov
California Department of Fish and Wildlife	Tina Bartlett	601 Locust Street, Redding, CA 96001
California Department of Fish and Wildlife-Retired	Alan Grass	al_grass@hotmail.com
California Department of Fish and Wildlife-Retired	Larry Week	leweek1@aol.com
California Department of Fish and Wildlife-Retired	Scott Downie	sdownie@suddenlink.net
California Farm Bureau	Karen Mills	kmills@cfbf.com
California Indian Environmental Alliance	Sherri Norris	sherri@cieaweb.org
California State Coastal Conservancy	Michael Bowen	mbowen@scc.ca.gov
California State Parks	Brendon Greenaway	brendon.greenaway@parks.ca.gov
State Water Resources Control Board	Dana Heinrich	Dana.Heinrich@waterboards.ca.gov
State Water Resources Control Board	Derek Wadsworth	Derek.Wadsworth@Waterboards.ca.gov
State Water Resources Control Board	Gil Falcone	Gil.Falcone@waterboards.ca.gov
State Water Resources Control Board	Joelle Geppert	joelle.geppert@waterboards.ca.gov
State Water Resources Control Board	Nathan Fisch	Nathan.Fisch@Waterboards.ca.gov
State Water Resources Control Board	Parker Thaler	parker.thaler@waterboards.ca.gov
State Water Resources Control Board	Rebecca Fitzgerald	RFitzgerald@waterboards.ca.gov

Organization	Name	Email or Street Address
State Water Board	Derek Wadsworth	1001 I Street, Sacramento, CA 95814
Native American Tribes		
Bear River Band of Rohnerville Rancheria	Josefina Frank	josefinafrank@brb-nsn.gov
Bear River Band of Rohnerville Rancheria	Melanie McCavour	thpo@brb-nsn.gov
Big Lagoon Rancheria	Virgil Moorehead	vmoorehead@earthlink.net
Big Valley Band of Pomo Indians of the Big Valley Rancheria	Flaman McCloud Jr.	Chairman@big-valley.net
Big Valley Rancheria of Pomo Indians	Anthony Jack	ajack@big-valley.net
Big Valley Rancheria of Pomo Indians	Baltsuwin Brown	2726 Mission Rancheria Road Lakeport, CA 95453
Blue Lake Rancheria	Jacob Pounds	jpounds@bluelakerancheria-nsn.gov
Cachil Dehe Band of Wintun Indians of the Colusa Indian Community	Wayne Mitchum Jr.	asmelser@colusa-nsn.gov
Cachil Dehe Band of Wintun Indians of the Colusa Indian Community	Jennie Mitchum	jmitchum@colusa-nsn.gov
Cahto Tribe	Mary Norris	chair@cahtotribe-nsn.gov
Cahto Tribe	Kendra Campbell	secretary_treasurer@cahtotribe-nsn.gov
Cahto Tribe	Tasheena Sloan	vicechair@cahtotribe-nsn.gov
Cahto Tribe	Aimie R. Lucas	P.O. Box 1239 Laytonville, CA 95454
Cahto Tribe	Richard J. Smith	info@cniga.com
Cher-Ae Heights Indian Community of the Trinidad Rancheria	Amy Atkins-Kelley	aatkins@TrinidadRancheria.com
Cher-Ae Heights Indian Community of the Trinidad Rancheria	Garth Sundberg	gsundberg@TrinidadRancheria.com
Cher-Ae Heights Indian Community of the Trinidad Rancheria	Rachel Sundberg	rsundberg@TrinidadRancheria.com
Cloverdale Rancheria of Pomo Indians	Patricia Hermosillo	info@cloverdalerancheria.com
Cortina Rancheria – Kletsel Dehe Band of Wintun Indians	Charlie Wright	P.O. Box 1630, Williams, CA 95987
Coyote Valley Band of Pomo Indians	Richard Campbell	vc@coyotevalley-nsn.gov
Coyote Valley Band of Pomo Indians	Michael Hunter	P.O. Box 39 / 7901 Hwy. 10, North Redwood Valley, CA 95470-0039
Coyote Valley Band of Pomo Indians	--	tribalgovernment@coyotevalley-nsn.gov
Dry Creek Rancheria of Pomo Indians	Sherrie Smith-Ferri	sherries@drycreekrancheria.com
Elem Indian Colony Pomo Tribe	Agustin Garcia	k.cole@elemindiancolony.org

Organization	Name	Email or Street Address
Elem Indian Colony Pomo Tribe	Kim Cole	k.cole@elemindiancolony.org
Elem Indian Colony Pomo Tribe	Thomas Brown	t.brown@elemindiancolony.org
Elk Valley Rancheria	Crista Stewart	cstewart@elk-valley.com
Elk Valley Rancheria	Dale Miller	dmiller@elk-valley.com
Elk Valley Rancheria	Kevin Mealue	kmealue@elk-valley.com
Elk Valley Rancheria	LaWanda Green	lgreen@elk-valley.com
Estom Yumeka Maidu Tribe of the Enterprise Rancheria	Glenda Nelson	info@enterpriserancheria.org
Estom Yumeka Maidu Tribe of the Enterprise Rancheria	Nelson Smith	nelsons@enterpriserancheria.org
Grindstone Rancheria of Wintun-Wailaki	Ronald Kirk	P.O. Box 63, Elk Creek, CA 95939
Guidiville Rancheria of California	Bunny Tarin	admin@guidiville.net
Guidiville Rancheria of California	Michael Derry	historian@guidiville.net
Habematolel Pomo of Upper Lake	Hope Marcks	hmarcks@hpultribe-nsn.gov
Habematolel Pomo of Upper Lake	M. Marcks	mmarcks@hpultribe-nsn.gov
Habematolel Pomo of Upper Lake	Robert Geary	rgeary@hpultribe-nsn.gov
Habematolel Pomo of Upper Lake	Danielle Cirelli	dcirelli@hpultribe-nsn.gov
Habematolel Pomo of Upper Lake	Sherry Treppa	P.O. Box 516, Upper Lake, CA 95485
Hoopa Valley Tribe	Kedueschа Lara-Colegrove	hvt.thpo@hoopa-nsn.gov
Hopland Band of Pomo Indians	Lyesha Miller	selliott@hoplandtribe.com
Hopland Band of Pomo Indians	Sonny Elliott	sjelliott@hoplandtribe.com
Hopland Band of Pomo Indians	Ramon Billy	thpo@hoplandtribe.com
InterTribal Sinkyone Wilderness Council	Hawk Rosales	info@sinkyone.org
Karuk Tribe	Alex Watts-Tobin	atobin@karuk.us
Karuk Tribe	Russell Attebery	battebery@karuk.us
Karuk Tribe	Bill Tripp	btripp@karuk.us
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Anthony Macias	anthony@stewartspoint.org
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Dino Franklin Jr.	dino@stewartspoint.org
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Jessica Chaves	jessica@stewartspoint.org
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Vaughn Pena	vaughn@stewartspoint.org

Organization	Name	Email or Street Address
Koi Nation of Northern California	Dino Beltran	dbeltran@koination.com
Koi Nation of Northern California	Darin Beltran	kn@koination.com
Koi Nation of Northern California	Robert Morgan	robmorgan@koination.com
Koi Nation of Northern California	Rob Morgan	robs_norcal@yahoo.com
Manchester Band of Pomo Indians of the Manchester Rancheria	Jaime Cobarrubia	P.O. Box 623, Point Arena, CA 95468
Manchester Band of Pomo Indians of the Manchester Rancheria	Ariel Escalera	ariel.escalera@mpapomotribe.org
Manchester Band of Pomo Indians of the Manchester Rancheria	Tisha Jones	tisha.jones@mpapomotribe.org
Manchester Band of Pomo Indians of the Manchester Rancheria	Paula Figueroa	paula.figueroa@mapomotribe.org
Melochundum Band of Tolowa Indians	Tribal Representative	P.O. Box 388, Fort Dick, CA 95538
Middletown Rancheria of Pomo Indians of California	C. Cardenas	ccardenas@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Michael Rivera Jr.	mlrivera@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Stephanie L. Reyes	THPO@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Jose Simon III	jsimon@middletownrancheria.com; sshope@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Michael Rivera	mlrivera@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Tribal Historic Preservation Department	THPO@middletownrancheria.com
Mishewal-Wappo Tribe of Alexander Valley	Christi Gabaldon	1tektekh@gmail.com
Mishewal-Wappo Tribe of Alexander Valley	Scott Gabaldon	scott@g4firearms.com; scottg@mishewalwappotribe.com
Nor-Rel-Muk Wintu Nation	John Hayward	cybersonnyhayward@icloud.com
Nor-Rel-Muk Wintu Nation	Cyndie Childress	NRMWintu@gmail.com
Nor-Rel-Muk Wintu Nation	Tracy Foster-Olstad	tfoster-olstad@ncidc.org
Noyo River Indian Community	Tribal Representative	P.O. Box 91, Fort Bragg, CA 95437
Paskenta Band of Nomlaki Indians	Laverne Bill	THPO@paskenta.org / Lbill@paskenta.org
Paskenta Band of Nomlaki Indians	Andrew Alejandre	22580 Olivewood Avenue Corning, CA 96021
Pinoleville Pomo Nation	Erica Carson	500 B Pinoleville Drive, Ukiah, CA 95482
Pinoleville Pomo Nation	Leona Willams	500 B Pinoleville Drive, Ukiah, CA 95482

Organization	Name	Email or Street Address
Pinoleville Pomo Nation	Vack Sampsel	500 B Pinoleville Drive, Ukiah, CA 95482
Potter Valley Tribe	Jason Lee	jason@thecirclelaw.com
Potter Valley Tribe	Michelle Lee	michelle@thecirclelaw.com
Potter Valley Tribe	--	waterresources@pottervalleytribe.com
Potter Valley Tribe	Salvador Rosales	pottervalleytribe@pottervalleytribe.com
Potter Valley Tribe	Gregg Young	pvtepadirector@pottervalleytribe.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Fawn Murphy	fawn.murphy@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Kathy Dowd	kathy.dowd@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Megan Rocha	megan.rocha@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Moonchay Dowd	moonchay.dowd@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Shaunna McCovey	shaunna.mccovey@resighinirancheria.com
Quartz Valley Indian Community	Harold Bennett	tribalchairman@qvir-nsn.gov
Redding Rancheria	Jack Potter	Jack.Potter@reddingrancheria-nsn.gov
Redding Rancheria	Lillie Lucero	Lillie.lucero@reddingrancheria-nsn.gov
Redding Rancheria	Tracy Edwards	Tracy.Edwards@reddingrancheria-nsn.gov
Redwood Valley or Little River Band of Pomo Indians	Debra Ramirez	rvrsecretary@comcast.net
Robinson Rancheria Band of Pomo Indians	Eddie J. Crandall	tavilabasket@yahoo.com
Robinson Rancheria of Pomo Indians	Beniakem Cromwell	bcromwell@rrcbc-nsn.gov
Robinson Rancheria of Pomo Indians	Luis Santana	lsantana@rrcbc-nsn.gov
Robinson Rancheria of Pomo Indians	Tribal Administrator	P.O. Box 4015, Nice, CA 95464
Round Valley Indian Tribes	Andrea Hilton	andrea@mcbainassociates.com
Round Valley Indian Tribes	Curtis Berkey	cberkey@berkeywilliams.com
Round Valley Indian Tribes	Erica Costa	ecosta@berkeywilliams.com
Round Valley Indian Tribes	Lewis Whipple	lwhipple@council.rvit.org; secretary@council.rvit.org
Round Valley Indian Tribes	Nikcole Whipple	nikcolewhipple@gmail.com
Round Valley Indian Tribes	Scott McBain	scott@mcbainassociates.com
Round Valley Indian Tribes	Scott Williams	swilliams@berkeywilliams.com
Round Valley Indian Tribes	Douglas Hutt	treasurer@council.rvit.org

Organization	Name	Email or Street Address
Round Valley Indian Tribes	Carlino Bettega	vicepresident@council.rvit.org
Round Valley Indian Tribes	Paula Britton	77826 Covelo Road, Covelo, CA 95428
Round Valley Indian Tribes	Stephanie Britton	77826 Covelo Road, Covelo, CA 95428
Round Valley Indian Tribes Round Valley Reservation / Covelo Indian Community	James Russ	jruss@rvit.org; tribalcouncil@rvit.org
Scotts Valley Band of Pomo Indians	Shawn Davis	shawn.davis@sv-nsn.gov
Scotts Valley Band of Pomo Indians	Donald Arnold	1005 Parallel Drive, Lakeport, CA 95453
Scotts Valley Band of Pomo Indians	Gabriel Ray	1005 Parallel Drive, Lakeport, CA 95453
Scotts Valley Band of Pomo Indians	Joann Wright	1005 Parallel Drive, Lakeport, CA 95453
Scotts Valley Band of Pomo Indians	Shannon Ford	1005 Parallel Drive, Lakeport, CA 95453
Shasta Indian Nation	Sami Jo Difuntorum	culture@shastaindiannation.org
Shasta Nation	Roy Hall	10808 Quartz Valley Road Fort Jones, CA 96032
Shebelna Band of Mendocino Coast Pomo Indians	Charlie Fales	19101 Olsen Lane, Fort Bragg, CA 95437
Sherwood Valley Rancheria Band of Pomo Indians	Javier Silva	jsilva@sherwoodband.com
Sherwood Valley Rancheria Band of Pomo Indians	Misty Cook	svbp.thpo@gmail.com
Sherwood Valley Rancheria Band of Pomo Indians	Michael Knight	190 Sherwood Hill Drive Willits, CA 95490
Sherwood Valley Rancheria of Pomo	Valerie Stanley	svrthpo@sherwoodband.com
Tolowa Dee ni' Nation	Amanda O'Connell	amanda.oconnell@tolowa.com
Tolowa Dee-ni' Nation	Leann McCallum	leann.babcock@tolowa.com
Tsnungwe Council	Paul Ammon	tsnungweofcalifornia@gmail.com
Wailaki Tribe	Louis Hoaglin Sr.	P.O. Box 684, Laytonville, CA 95454
Winnemem Wintu Tribe	Caleen Sisk	caleenwintu@gmail.com
Winnemem Wintu Tribe	Mark Miyoshi	markmwinnemem@gmail.com
Wintu Tribe of Northern California	Shawna Garcia	garciawintu@gmail.com
Wintu Tribe of Northern California	Cindy Hogue	Hogue1hogue@gmail.com
Wintu Tribe of Northern California	Jeremy Hogue	jhogue1999@gmail.com
Wintu Tribe of Northern California	Melissa Rogers	norcalmelissa@hotmail.com
Wintu Tribe of Northern California	Wade McMaster	wintu.tribe1@gmail.com
Wintu Tribe of Northern California	Gary Rickard	wintun1@hotmail.com
Wiyot Tribe	Adam Canter	adam@wiyot.us

Organization	Name	Email or Street Address
Wiyot Tribe	Marisa McGrew	marisa@wiyot.us
Wiyot Tribe	Marnie Atkins	secretary@wiyot.us
Wiyot Tribe	Michelle Vassel	michelle@wiyot.us
Wiyot Tribe	Ted Hernandez	ted@wiyot.us
Yocha Dehe Wintun Nation	James Kinter	jkinter@yochadehe.gov
Yocha Dehe Wintun Nation	Leland Kinter	lkinter@yochadehe.gov
Yocha Dehe Wintun Nation	Anthony Roberts	thpo@yochadehe.gov
Yocha Dehe Wintun Nation	Yvonne Perkins	thpo@yochadehe.gov
Yokayo Tribe	Chairperson	P.O. Box 362, Talmage, CA 95481
Yuki/Wailaki	Deborah Hutt	Debb_hutt@yahoo.com
Yurok Tribe	Joe James	jjames@yuroktribe.nsn.gov
Yurok Tribe	Rosie Clayburn	rclayburn@yuroktribe.nsn.us
Yurok Tribe	Yurok Tribe	P.O. Box 1027, Klamath, CA 95548
Local Government		
City of Petaluma	John Brown	citymgr@ci.petaluma.ca.us
City of Santa Rosa	Jennifer Burke	jburke@srcity.org
City of Ukiah	Sage Sangiacomo	ssangiacomo@cityofukiah.com
Lake County	Bruno Sabatier	Bruno.Sabatier@lakecountyca.gov
Lake County Administrative Officer	Carol Huchingson	Carol.Huchingson@lakecountyca.gov
Lake County	Eddie Crandell	Eddie.Crandell@lakecountyca.gov
Lake County Board of Supervisors	Jessica Pyska	255 N. Forbes Street, Lakeport, CA 95453
Lake County Board of Supervisors	Matthew Rothstein	matthew.rothstein@lakecountyca.gov
Lake County	Patrick Sullivan	Patrick.Sullivan@lakecountyca.gov
Mendocino County Chief Executive Officer	Carmel J. Angelo	ceo@co.mendocino.ca.us
Sonoma County	Adam Brand	Adam.Brand@sonoma-county.org
Sonoma County Board of Supervisors	James Gore	James.Gore@sonoma-county.org
Town of Windsor	John Jansons	jjansons@townofwindsor.com
Public Agencies		
Calpella County Water District, Millview County Water District	Jared Walker	jwalker@willowcwd.org
Geyserville Water Works	Harry Bosworth	harry@bosworthandson.com
Humboldt County Administrative Officer	Amy Nilsen	cao@co.humboldt.ca.us

Organization	Name	Email or Street Address
Humboldt County Public Works	Hank Seemann	hseemann@co.humboldt.ca.us
Humboldt County Resource Conservation District	Donna Chambers	donnahcrcd@yahoo.com
Humboldt County Resource Conservation District	Doreen Hansen	dhhcrcd@gmail.com
Humboldt County Resource Conservation District	Jill Demers	jillhcrcd@yahoo.com
Mendocino County Farm Bureau	Devon Jones	director@mendofb.org
Mendocino County Farm Bureau	Estelle Clifton	director@mendofb.org
Mendocino County Farm Bureau	Frost Pauli	fpauli@pauliranch.com
Mendocino County Inland Water and Power Commission	Janet Pauli	iwpc@mendoiwpc.com; jpauli@pauliranch.com
Mendocino County Resource Conservation District	Janet Olave	410 Jones St. Ste. C-3, Ukiah, CA 95482
Mendocino County Resource Conservation District	Joseph Scriven	joe.scriven@mcrcd.org
Mendocino County Russian River Flood Control and Water Conservation Improvement District	Christopher Watt	DistrictManager@rrfc.net
Mendocino County Russian River Flood Control and Water Conservation Improvement District	Tamara Alaniz	rrfc@pacific.net
Mendocino County Russian River Flood Control and Water Conservation Improvement District	Will Carson	wcc3rd@gmail.com
Mendocino County Water Agency	Chief Executive Officer	ceo@co.mendocino.ca.us
North Coast Regional Water Quality Control Board	Bryan McFadin	bryan.mcfadin@waterboards.ca.gov
North Marin Water District	Anthony Williams	info@nmwb.com
North Marin Water District	Bob Maddow	rmaddow@bpmnj.com
North Marin Water District	Drew McIntyre	dmcintyre@nmwd.com
Potter Valley Community Services District	Patricia E. Harreschou	harreschou@pacific.net
Potter Valley Irrigation District	Janet Pauli	jpauli@pauliranch.com; jpauli@pottervalleywater.org
Potter Valley Irrigation District	Kenneth Stroh	
Potter Valley Irrigation District	Steve Elliott	selliott@pottervalleywater.org
Redwood Valley County Water District	Adam Gaska	300 Seminary Avenue, Ukiah, CA 95482
Russian River Watershed Association	Andy Rodgers	info@rrwatershed.org

Organization	Name	Email or Street Address
Russian River Watershed Conservation Council	Douglas McIlroy	dmcilroy@rodneystrong.com
Sonoma County Farm Bureau	Dayna Ghirardelli	dayna@sonomafb.org
Sonoma County Farm Bureau	Tito Sasaki	tito@att.net
Sonoma County Farm Bureau	Tawny Tesconi	tawny@sonomafb.org
Sonoma County Water Agency	Brad Sherwood	Brad.Sherwood@scwa.ca.gov
Sonoma County Water Agency	Chris Delaney	cdelaney@scwa.ca.gov
Sonoma County Water Agency	David Manning	david.manning@scwa.ca.gov
Sonoma County Water Agency	Don Seymour	Donald.Seymour@scwa.ca.gov
Sonoma County Water Agency	Gregory Guensch	Gregory.Guensch@scwa.ca.gov
Sonoma County Water Agency	Jessica Martini-Lamb	jessicam@scwa.ca.gov
Sonoma County Water Agency	Justin Smith	jpsmith@scwa.ca.gov
Sonoma County Water Agency	Melissa James	melissa.james@scwa.ca.gov
Sonoma County Water Agency	Pam Jeane	pam.jeane@scwa.ca.gov
Sonoma County Water Agency	Todd Schram	tschram@scwa.ca.gov
Sonoma Water	Pamela Jeane	pam.jeane@scwa.ca.gov
Ukiah Valley Sanitation District Chair	Ernie Wipf	wipf@pacbell.net
Water Advisory Committee, City of Petaluma Council Member	Mike Healy	mhealy@cityofpetaluma.org
Non-Governmental and Community Organizations		
American Whitewater	John Simpkin	johnmsimpkin3@gmail.com
American Whitewater	Scott Harding	scott@americanwhitewater.org
American Whitewater	Theresa Simsiman	theresa@americanwhitewater.org
American Rivers, American Whitewater	Meghan Quinn	mquinn@americanrivers.org
California Land Stewardship Institute	Laurel Marcus	laurelm@fishfriendlyfarming.org
California Sportfishing Protection Alliance	Chris Shutes	blancapaloma@msn.com
California Trout	Curtis Knight	cknight@caltrout.org
California Trout	Darren Mierau	dmierau@caltrout.org
California Trout	Mary Burke	mburke@caltrout.org
California Trout	Walter Collins	rcollins@caltrout.org
California Trout, Trout Unlimited	Charlie Schneider	cschneider@caltrout.org
CalWild	Ruth Atkins	ratkins@calwild.org

Organization	Name	Email or Street Address
Carmel River Steelhead Association (CRSA), FTE	Steve Park	stevepark@razzolink.com
Eel River Recovery Project	Barbara Domanchuk	bad@humboldt1.com
Eel River Recovery Project	David Sopjes	ferndalescience@yahoo.com
Eel River Recovery Project	Diane Higgins	4joy@suddenlink.net
Eel River Recovery Project	Pat Higgins	phiggins@humboldt1.com
Eel River Watershed Improvement Group	Ruth Goodfield	info@erwig.org
Friends of the Eel River	Alicia Hamann	alicia@eelriver.org
Friends of the Eel River	Daniel Fisher	dcfisher@umich.edu
Friends of the Eel River	David Keller	dkeller@eelriver.org
Friends of the Eel River	David Talamo	ed@wildernessreflections.com
Friends of the Eel River	Ellison Folk	folk@smwlaw.com
Friends of the Eel River	Francesca Bikel	tobeinberkeley@yahoo.com
Friends of the Eel River	Jeffrey Fanok	jfanok@comcast.net
Friends of the Eel River	Marilyn Wargo	margowolf49@icloud.com
Friends of the Eel River	Melvin Kreb	floodplain@asis.com
Friends of the Eel River	Scott Greacen	scott@eelriver.org
Friends of the Eel River	Susan Nolan	snolan@humboldt1.com
Friends of the Eel River	Tom Wheeler	P.O. Box 4945, Arcata, CA 95518
Friends of the Eel River	Tryphena Lewis	tryphena@asis.com
Friends of the Eel River / Native Fish Society	Samantha Kannry	skannry@gmail.com
Friends of Van Duzen River	Sal Steinberg	steinberg.sal@gmail.com
Lake Pillsbury Alliance	Frank Lynch	cinquini@sonic.net
Lake Pillsbury Volunteer Fire Department	Phillipp Harris	lpfpd953@gmail.com
Lake Pillsbury Volunteer Fire Department	Larry Thompson	larrythompson956@gmail.com
Native Fish Society	Mark Sherwood	mark@nativefishsociety.org
Northern CA Engineering Contractor's Association	Mary Kennedy Cabrera	mary@ncecca.org
Northern CA Engineering Contractors Association	John Bly	P.O. Box 8429, Santa Rosa, CA 95407
Orca Conservancy	Shari Tarantino	P.O. Box 16628, Seattle, WA 98116

Organization	Name	Email or Street Address
Pacific Coast Federation of Fisherman's Associations	Glen H. Spain	fish1ifr@aol.com
Palomino Lakes Mutual Water Company	David Taber	palominowaterco@gmail.com
Power in Nature Coalition	Josefina Barrantes	josephina@wildcalifornia.org
Russian Riverkeepers	Jaime Neary	jaime@russianriverkeeper.org
Salmon Restoration Federation	Dana Stolzman	srf@calsalmon.org
Salt River Ecosystem Restoration	Steve Allen	Steve.Allen@ghd.com
Santa Rosa Chamber of Commerce	Jonathan Coe	jonathanc@santarosachamber.com
Save California Salmon	Regina Chichizola	regina@savecaliforniasalmon.org
Sierra Club Redwood Chapter	Dan Mayhew	drmayhew@comcast.net
Sonoma Alliance for Vineyards & Environment	Mike Martini	mikem@taftstreetwinery.com
Sonoma County West Coast Watershed	Katherine Gledhill	kgledhill@westcoastwatershed.com
Trout Unlimited	Anna Halligan	ahalligan@tu.org
Trout Unlimited	Brian Johnson	bjohnson@tu.org; brian.johnson@tu.org
Trout Unlimited	Chandra Ferrari	cferrari@tu.org
Trout Unlimited	Matt Clifford	mclifford@tu.org; Matt.Clifford@tu.org
Trout Unlimited, FTE	Peter Mangarella	pmangarella44@gmail.com
Trout Unlimited, FTE	Creighton Smith	cr8smith@gmail.com
Trout Unlimited, FTE	Elise Ferrarese	elise.ferrarese@tu.org
Tribal EcoRestoration Alliance	Christina Lara	clara@tribalecorestoration.org
Wildlands Conservancy	Landon Peppel	landon.p@twc-ca.org
Public and Private Entities		
BCD Farms, LLC	Ray Carlson	N/A
Bradford Ranch, LLC	Peter R. Bradford	N/A
Constellation Brands	Thomas Gore	N/A
Downey Brand LLP	Scott Shapiro	N/A
Draxton Wines	Pat Burns	N/A
First Presbyterian Church	John Melsness	N/A
Garcia and Associates	Elizabeth Harreschou	N/A
Garcia and Associates	Jen Riddell	N/A
Humboldt State University	Emily Cooper	N/A
Humboldt State University	Terry Roelofs	N/A

Organization	Name	Email or Street Address
Humboldt State University River Institute	Bill Trush	N/A
Humboldt State University River Institute	Dr. Alison O'Dowd	N/A
Humboldt University	Richard Gienger	N/A
Institute for Fisheries Resources	Andy Colonna	N/A
Institute for Fisheries Resources	Glen Spain	N/A
Institute for Fisheries Resources	Regina Chichizola	N/A
Institute for Fisheries Resources	Vivian Helliwell	N/A
Joint Proponents / Eel-Russian Project Authority (ERPA)	Joint Proponents	N/A
Kamman Hydrology and Engineering, FOER	Greg Kamman	N/A
Kearns & West	Anna West	N/A
Kearns & West	Greg Bourne	N/A
Kearns & West	Michael Harty	N/A
Lake Pillsbury Homesite Association	Frank Lynch	N/A
Lake Pillsbury Homesite Association (LPHA)	Kris Patalano	N/A
Lake Pillsbury Homesite Association (LPHA)	Susan Berger	N/A
Lake Pillsbury Ranch	All Board Members	N/A
Lake Pillsbury Ranch	Carolyn Winn	N/A
Lake Pillsbury Ranch	Jill Clarkson	N/A
Lake Pillsbury Ranch	Mike Nelson	N/A
Lake Pillsbury Resort – Biagi Bros., Inc.	Mark C. Parnell, CPA	N/A
Lake Pillsbury Resort – Biagi Bros., Inc.	Mike and Maryann	N/A
LP Resident	Kristen Olson	N/A
McGinnis and Associates	Caitlyn Hoon	N/A
McGinnis and Associates	Dietrick McGinnis	N/A
Mendocino Redwood Company	Mike Miles	N/A
Mendocino Voice	Sarah Reith	N/A
Milovina Vineyards	David Milovina	N/A
Milovina Vineyards	Michael Milovina	N/A

Organization	Name	Email or Street Address
Pacific Watershed Associates	Todd Kraemer	N/A
Potter Valley property owner	Jerry Morris	N/A
Private Interested Party	Aaron Gladman	N/A
Private Interested Party	Aaron Mazzrillo	N/A
Private Interested Party	Acacia Crouch	N/A
Private Interested Party	Adam Fuller	N/A
Private Interested Party	Adam Kilburn	N/A
Private Interested Party	Adam Messinger	N/A
Private Interested Party	Adina Merenlender	N/A
Private Interested Party	AJ Frankel	N/A
Private Interested Party	Al White	N/A
Private Interested Party	Alan Voigt	N/A
Private Interested Party	Alex Blouin	N/A
Private Interested Party	Alex Burton	N/A
Private Interested Party	Alexander Franco	N/A
Private Interested Party	Alexander Fulton	N/A
Private Interested Party	Ali Azidehak	N/A
Private Interested Party	Ali Maiorano	N/A
Private Interested Party	Alison Attek	N/A
Private Interested Party	Allan Williams	N/A
Private Interested Party	Allyne Brown	N/A
Private Interested Party	Allyson Woods	N/A
Private Interested Party	Andrew Alper	N/A
Private Interested Party	Andrew Bassak	N/A
Private Interested Party	Andrew Foster	N/A
Private Interested Party	Andrew Klontz	N/A
Private Interested Party	Andrew Murphy	N/A
Private Interested Party	Andrew Nicol	N/A
Private Interested Party	Angel Aguilar	N/A
Private Interested Party	Angle Slater	N/A
Private Interested Party	Ann Gause	N/A
Private Interested Party	Anna FarPorte	N/A
Private Interested Party	Anthony Baroza	N/A

Organization	Name	Email or Street Address
Private Interested Party	Anthony Gilleece	N/A
Private Interested Party	Anthony Les	N/A
Private Interested Party	Arthur Strauss	N/A
Private Interested Party	Ashlynn Rose	N/A
Private Interested Party	Austin Broder	N/A
Private Interested Party	Bey Forghani	N/A
Private Interested Party	Bill Corum	N/A
Private Interested Party	Bill Gardner	N/A
Private Interested Party	Blain Tomlinson	N/A
Private Interested Party	Bob Algieri	N/A
Private Interested Party	Bob Seyms	N/A
Private Interested Party	Bobby Gaston	N/A
Private Interested Party	Bode Gower	N/A
Private Interested Party	Brad Bennigson	N/A
Private Interested Party	Brad Gee	N/A
Private Interested Party	Brad Ruddell	N/A
Private Interested Party	Brandon Blizman	N/A
Private Interested Party	Brandon Herman	N/A
Private Interested Party	Brandon Huelga	N/A
Private Interested Party	Brandon Paul	N/A
Private Interested Party	Brett Sanders	N/A
Private Interested Party	Brian Bartell	N/A
Private Interested Party	Brian Biggs	N/A
Private Interested Party	Brian Cartier	N/A
Private Interested Party	Brian Clack	N/A
Private Interested Party	Brian Ibenthal	N/A
Private Interested Party	Brian Means	N/A
Private Interested Party	Brice Lemley	N/A
Private Interested Party	Bruce Campbell	N/A
Private Interested Party	Bruce Carter	N/A
Private Interested Party	Bruce Cochran	N/A
Private Interested Party	Bruce Dau	N/A
Private Interested Party	Bruce Olitzky	N/A

Organization	Name	Email or Street Address
Private Interested Party	Bruce Slightom	N/A
Private Interested Party	Bryan Tornay	N/A
Private Interested Party	Camilla Ingram	N/A
Private Interested Party	Cari Torres	N/A
Private Interested Party	Carl Boling	N/A
Private Interested Party	Carol Boles	N/A
Private Interested Party	Carol Lam	N/A
Private Interested Party	Carrie Shattuck	N/A
Private Interested Party	Carson Cox	N/A
Private Interested Party	Cary Bush	N/A
Private Interested Party	Cassandra Rideg	N/A
Private Interested Party	Catrina Lessley	N/A
Private Interested Party	Chad Roberts	N/A
Private Interested Party	Charles B. Mannon	N/A
Private Interested Party	Charles Dilworth	N/A
Private Interested Party	Charles Dyke	N/A
Private Interested Party	Charles Fontana	N/A
Private Interested Party	Charles Gilfillan	N/A
Private Interested Party	Charles Hammerstad	N/A
Private Interested Party	Che Garcia	N/A
Private Interested Party	Chris Armstrong	N/A
Private Interested Party	Chris Costello	N/A
Private Interested Party	Chris Del Carlo	N/A
Private Interested Party	Chris Johnson	N/A
Private Interested Party	Chris Lang	N/A
Private Interested Party	Chris O'Connell	N/A
Private Interested Party	Chris Storm	N/A
Private Interested Party	Chris Trafecanty	N/A
Private Interested Party	Christopher Brand	N/A
Private Interested Party	Christopher Harrod	N/A
Private Interested Party	Christopher Kight	N/A
Private Interested Party	Chuck Nelson	N/A
Private Interested Party	Claire Parker	N/A

Organization	Name	Email or Street Address
Private Interested Party	Clarke Michalak	N/A
Private Interested Party	Cliff Cruickshank	N/A
Private Interested Party	Colin Harris	N/A
Private Interested Party	Collin Cochrane	N/A
Private Interested Party	Cooper Henderson	N/A
Private Interested Party	Corey Raffel	N/A
Private Interested Party	Craig Benson	N/A
Private Interested Party	Craig Jaffe	N/A
Private Interested Party	Crandall Harvey	N/A
Private Interested Party	Curtis Kerrick	N/A
Private Interested Party	Dan Reynolds	N/A
Private Interested Party	Dan Silver	N/A
Private Interested Party	Dana Swisher	N/A
Private Interested Party	Dane Downing	N/A
Private Interested Party	Daniel Diiulio	N/A
Private Interested Party	Daniel Duncan	N/A
Private Interested Party	Daniel Nickerson	N/A
Private Interested Party	Daniel Pace	N/A
Private Interested Party	Dave Gifford	N/A
Private Interested Party	Dave Luhrs	N/A
Private Interested Party	Dave Mahler	N/A
Private Interested Party	Dave Schlom	N/A
Private Interested Party	David Boutacoff	N/A
Private Interested Party	David Briney	N/A
Private Interested Party	David Douglas	N/A
Private Interested Party	David Fujimoto	N/A
Private Interested Party	David Gaker	N/A
Private Interested Party	David Gleisser	N/A
Private Interested Party	David Horovitz	N/A
Private Interested Party	David Koch	N/A
Private Interested Party	David Moser	N/A
Private Interested Party	David Olson	N/A
Private Interested Party	David Raymaker	N/A

Organization	Name	Email or Street Address
Private Interested Party	David Schendel	N/A
Private Interested Party	David Talamo (submitted twice)	N/A
Private Interested Party	Dax Messett	N/A
Private Interested Party	Dayna Hildebrand	N/A
Private Interested Party	Deirdre Lamb	N/A
Private Interested Party	Denise Dills	N/A
Private Interested Party	Dennis Romano	N/A
Private Interested Party	Deryn Harris	N/A
Private Interested Party	Diane H. Davis	N/A
Private Interested Party	Don and Karol Chase	N/A
Private Interested Party	Donald Forthal	N/A
Private Interested Party	Donna Deaton	N/A
Private Interested Party	Doug Giancoli	N/A
Private Interested Party	Dougald Scott	N/A
Private Interested Party	Duff Bevill	N/A
Private Interested Party	Dwight Johnson	N/A
Private Interested Party	Earl Frounfelter	N/A
Private Interested Party	Ed Brenner	N/A
Private Interested Party	Edgar Pierluissi	N/A
Private Interested Party	Edric Alvarez	N/A
Private Interested Party	Edward Brenner	N/A
Private Interested Party	Edward Buckley	N/A
Private Interested Party	Edwin Salkeld	N/A
Private Interested Party	Elias Blood	N/A
Private Interested Party	Elizabeth Dodge	N/A
Private Interested Party	Elizabeth Taylor	N/A
Private Interested Party	Emily Nichols	N/A
Private Interested Party	Eric Arentsen	N/A
Private Interested Party	Eric Leland	N/A
Private Interested Party	Eric Tye	N/A
Private Interested Party	Erik Havana	N/A
Private Interested Party	Erik Larson	N/A

Organization	Name	Email or Street Address
Private Interested Party	Ernesto Anguiano	N/A
Private Interested Party	Ernie DeGraff	N/A
Private Interested Party	Esteban Carrillo	N/A
Private Interested Party	Evan Larson	N/A
Private Interested Party	Felton Jenkins	N/A
Private Interested Party	Fletcher Chouinard	N/A
Private Interested Party	Frank Wetmore	N/A
Private Interested Party	Franklin Moitoza	N/A
Private Interested Party	Fred Good	N/A
Private Interested Party	Fred Schardt	N/A
Private Interested Party	Freya Sylvester	N/A
Private Interested Party	Gabe Babcock	N/A
Private Interested Party	Gale Gallegos	N/A
Private Interested Party	Garrett Berkey	N/A
Private Interested Party	Gary Barisone	N/A
Private Interested Party	Gary Gradek	N/A
Private Interested Party	Gary Sack	N/A
Private Interested Party	Gene Gaffney	N/A
Private Interested Party	Gene Weber	N/A
Private Interested Party	George Boero	N/A
Private Interested Party	George Cinquini	N/A
Private Interested Party	George Cotsirilos	N/A
Private Interested Party	George Coughlin	N/A
Private Interested Party	George Croton	N/A
Private Interested Party	George Robinette	N/A
Private Interested Party	George Sutherland	N/A
Private Interested Party	George TeVelde	N/A
Private Interested Party	Georgina Quinn	N/A
Private Interested Party	Gerald Cunha	N/A
Private Interested Party	Gildo Tournour	N/A
Private Interested Party	Gordon Dow	N/A
Private Interested Party	Gracie Boles	N/A
Private Interested Party	Graham Gardner	N/A

Organization	Name	Email or Street Address
Private Interested Party	Greg Wrisley	N/A
Private Interested Party	Gregg Young	N/A
Private Interested Party	Gregory Abe	N/A
Private Interested Party	Gregory Schaefer	N/A
Private Interested Party	Halley Bruno	N/A
Private Interested Party	Hannah Foster	N/A
Private Interested Party	Hans Stephenson	N/A
Private Interested Party	Harold Turner	N/A
Private Interested Party	Harry Goertz	N/A
Private Interested Party	Heidi Taylor	N/A
Private Interested Party	Henry S.	N/A
Private Interested Party	Henry S. Hundley	N/A
Private Interested Party	Hilary Bates	N/A
Private Interested Party	Hunter Vaught	N/A
Private Interested Party	Ian Tinney	N/A
Private Interested Party	Isabel Anderson	N/A
Private Interested Party	Isabella Juggler	N/A
Private Interested Party	Izzie Rodriguez	N/A
Private Interested Party	Jack & JoAnn Jex	N/A
Private Interested Party	Jack Neff	N/A
Private Interested Party	Jackson Franklin	N/A
Private Interested Party	Jacob Palmer	N/A
Private Interested Party	Jaime Vonfeldt	N/A
Private Interested Party	James Adams	N/A
Private Interested Party	James Burton	N/A
Private Interested Party	James Dickens	N/A
Private Interested Party	James Kawamura	N/A
Private Interested Party	James Killiany	N/A
Private Interested Party	James Milovina	N/A
Private Interested Party	James Pearson	N/A
Private Interested Party	James Stewart	N/A
Private Interested Party	James Taylor	N/A
Private Interested Party	James Vogel	N/A

Organization	Name	Email or Street Address
Private Interested Party	Jane Henderson	N/A
Private Interested Party	Jared Figurski	N/A
Private Interested Party	Jasha Bucks	N/A
Private Interested Party	Jason Hallas	N/A
Private Interested Party	Jason Hartwick	N/A
Private Interested Party	Javier Silva	N/A
Private Interested Party	Jeff Hunt	N/A
Private Interested Party	Jeff Kaminski	N/A
Private Interested Party	Jeff Lorelli	N/A
Private Interested Party	Jeff Pierce	N/A
Private Interested Party	Jeff Rosendale	N/A
Private Interested Party	Jeffrey Coupe	N/A
Private Interested Party	Jeffrey Fairfield	N/A
Private Interested Party	Jeffrey Johnsrud	N/A
Private Interested Party	Jeffrey Muscatine	N/A
Private Interested Party	Jennifer Watson	N/A
Private Interested Party	Jeremy Estrada	N/A
Private Interested Party	Jerry Albright	N/A
Private Interested Party	Jerry Bender	N/A
Private Interested Party	Jerry McKeon	N/A
Private Interested Party	Jesse LaForce	N/A
Private Interested Party	Jim Burns	N/A
Private Interested Party	Jim Connelly	N/A
Private Interested Party	Jim Genes	N/A
Private Interested Party	Jim Molinari	N/A
Private Interested Party	Jim Monical	N/A
Private Interested Party	Jim Zelko	N/A
Private Interested Party	Jimmy Duggins	N/A
Private Interested Party	Joe Cech	N/A
Private Interested Party	Joe Gaffney	N/A
Private Interested Party	Joe Hiney	N/A
Private Interested Party	Joe Lanaido	N/A
Private Interested Party	Joel Despain	N/A

Organization	Name	Email or Street Address
Private Interested Party	Joel Martin	N/A
Private Interested Party	Joerg Olson	N/A
Private Interested Party	John Almida	N/A
Private Interested Party	John Brennan	N/A
Private Interested Party	John Davey	N/A
Private Interested Party	John DiMercurio	N/A
Private Interested Party	John Dolinsek	N/A
Private Interested Party	John Fredrick	N/A
Private Interested Party	John Hurabiell	N/A
Private Interested Party	John Koene	N/A
Private Interested Party	John Marchwick	N/A
Private Interested Party	John Mullenholz	N/A
Private Interested Party	John Mullin	N/A
Private Interested Party	John Nesheim	N/A
Private Interested Party	John Proulx	N/A
Private Interested Party	John Sack	N/A
Private Interested Party	Jon Jeswald	N/A
Private Interested Party	Jonathan Hubbard	N/A
Private Interested Party	Joseph Gradek	N/A
Private Interested Party	Joseph Nichols	N/A
Private Interested Party	Josh Bennett	N/A
Private Interested Party	Josh Restad	N/A
Private Interested Party	JT Abbott	N/A
Private Interested Party	Julia Sherwin	N/A
Private Interested Party	Julian Mann	N/A
Private Interested Party	Julie Golden	N/A
Private Interested Party	Julie Wilson	N/A
Private Interested Party	Justin Coupe	N/A
Private Interested Party	Justin Eck	N/A
Private Interested Party	Justin Shilton	N/A
Private Interested Party	Justo-Jose Tapia-Padron	N/A
Private Interested Party	Jyrki Hoisko	N/A
Private Interested Party	Kamryn Cordisco	N/A

Organization	Name	Email or Street Address
Private Interested Party	Karen Growney	N/A
Private Interested Party	Kate Bailey	N/A
Private Interested Party	Kathryn Wild	N/A
Private Interested Party	Kaushal Raju	N/A
Private Interested Party	Keith Anderson	N/A
Private Interested Party	Keith Kolischak	N/A
Private Interested Party	Kelly Lincoln	N/A
Private Interested Party	Kelly Marik	N/A
Private Interested Party	Ken Gotelli	N/A
Private Interested Party	Ken H. Foster	N/A
Private Interested Party	Ken Rasler	N/A
Private Interested Party	Ken Robison	N/A
Private Interested Party	Ken Rupnik	N/A
Private Interested Party	Kenneth Walker	N/A
Private Interested Party	Kevin Ashbran	N/A
Private Interested Party	Kevin Boles	N/A
Private Interested Party	Kevin Fee	N/A
Private Interested Party	Kevin Growney	N/A
Private Interested Party	Kevin Kuhn	N/A
Private Interested Party	Kevin Mahoney	N/A
Private Interested Party	Kevin Sheldahl	N/A
Private Interested Party	Kevin Shore	N/A
Private Interested Party	Kiana Burns	N/A
Private Interested Party	Kim Lloyd	N/A
Private Interested Party	Kimber Carpenter Lenning	N/A
Private Interested Party	Kirk Lumpkin	N/A
Private Interested Party	Kirk Uhrlaub	N/A
Private Interested Party	Kristin Womack	N/A
Private Interested Party	Kyle Alldredge	N/A
Private Interested Party	Kyle Kertscher	N/A
Private Interested Party	Larry Thornton	N/A
Private Interested Party	Larry Vollintine	N/A
Private Interested Party	Laura Raymond	N/A

Organization	Name	Email or Street Address
Private Interested Party	Laurie Alaimo	N/A
Private Interested Party	Lawrence Kress	N/A
Private Interested Party	Leah Middleton	N/A
Private Interested Party	Lee Boatright	N/A
Private Interested Party	Lee Dedini	N/A
Private Interested Party	Leonard Meyer	N/A
Private Interested Party	Leslie Leach	N/A
Private Interested Party	Liam Gallagher	N/A
Private Interested Party	Lloyd Stradley	N/A
Private Interested Party	Lori Howk	N/A
Private Interested Party	LouAnne Insprucker	N/A
Private Interested Party	Luka Kosanin	N/A
Private Interested Party	Luke Cattau	N/A
Private Interested Party	Luke Fuller	N/A
Private Interested Party	Lynn Halsted	N/A
Private Interested Party	Madeline Cline	N/A
Private Interested Party	Magenta Granzberg	N/A
Private Interested Party	Malcolm Johnson-Flint	N/A
Private Interested Party	Marco Mendoza	N/A
Private Interested Party	Maria Morrow	N/A
Private Interested Party	Marigold Klein	N/A
Private Interested Party	Marilyn Dalton	N/A
Private Interested Party	Marisa Raya	N/A
Private Interested Party	Mark Gangi	N/A
Private Interested Party	Mark Lorman	N/A
Private Interested Party	Mark Mathis	N/A
Private Interested Party	Mark Shaughnessy	N/A
Private Interested Party	Mark Shelton	N/A
Private Interested Party	Mark Speer	N/A
Private Interested Party	Mark Triska	N/A
Private Interested Party	Mark Whisler	N/A
Private Interested Party	Marshall Kilduff	N/A
Private Interested Party	Marshall Lucier	N/A

Organization	Name	Email or Street Address
Private Interested Party	Marty Jansen	N/A
Private Interested Party	Mason Sullivan	N/A
Private Interested Party	Mateo Malko	N/A
Private Interested Party	Matt Andrus	N/A
Private Interested Party	Matthew Welch	N/A
Private Interested Party	Merritt Perry	N/A
Private Interested Party	Michael Caranci	N/A
Private Interested Party	Michael Clifton	N/A
Private Interested Party	Michael Costello	N/A
Private Interested Party	Michael Dailey	N/A
Private Interested Party	Michael Flynn	N/A
Private Interested Party	Michael Heyl	N/A
Private Interested Party	Michael Mallory	N/A
Private Interested Party	Michael Morris	N/A
Private Interested Party	Michael O'Looney	N/A
Private Interested Party	Michael Stapleton	N/A
Private Interested Party	Michael Winter	N/A
Private Interested Party	Michelle Merrifield	N/A
Private Interested Party	Mike Downing	N/A
Private Interested Party	Mike Maguire	N/A
Private Interested Party	Mike Pipkin	N/A
Private Interested Party	Monique Vidal	N/A
Private Interested Party	Nancy Ihara	N/A
Private Interested Party	Nancy Todd	N/A
Private Interested Party	Nat Smith	N/A
Private Interested Party	Natalie Barlow	N/A
Private Interested Party	Natalie Stauffer-Olsen	N/A
Private Interested Party	Nate Constan	N/A
Private Interested Party	Nathaniel North	N/A
Private Interested Party	Neil Stifter	N/A
Private Interested Party	Nels Long	N/A
Private Interested Party	Nicholas Barclay	N/A
Private Interested Party	Nicolas Bakken-French	N/A

Organization	Name	Email or Street Address
Private Interested Party	Oliver Jepson	N/A
Private Interested Party	Olivia Jenae	N/A
Private Interested Party	Orion Helms	N/A
Private Interested Party	Paige Green	N/A
Private Interested Party	Pam and Richard Respari	N/A
Private Interested Party	Patrick Horvath	N/A
Private Interested Party	Patrick Kallerman	N/A
Private Interested Party	Patrick Owen	N/A
Private Interested Party	Patrizia Hironimus	N/A
Private Interested Party	Paul Boero	N/A
Private Interested Party	Paul Jablon	N/A
Private Interested Party	Paul Kelsey	N/A
Private Interested Party	Paul McPartland	N/A
Private Interested Party	Paul Wofford	N/A
Private Interested Party	Paul Zellman	N/A
Private Interested Party	Persephone St. Hilaire	N/A
Private Interested Party	Pete Przybylinski	N/A
Private Interested Party	Peter Douglas	N/A
Private Interested Party	Peter Pyle PG, CHG	N/A
Private Interested Party	Peter Taylor	N/A
Private Interested Party	Phil Williams	N/A
Private Interested Party	Philip Swett	N/A
Private Interested Party	Phillip Kirkland	N/A
Private Interested Party	Rachel Harris	N/A
Private Interested Party	Rachelle Sack	N/A
Private Interested Party	Rahkiv Lewis	N/A
Private Interested Party	Ray Lorensen	N/A
Private Interested Party	Redge Hawkley	N/A
Private Interested Party	Ren Huschle	N/A
Private Interested Party	Reoh Darwell	N/A
Private Interested Party	Rich Zellman	N/A
Private Interested Party	Richard Maas	N/A
Private Interested Party	Richard Needoba	N/A

Organization	Name	Email or Street Address
Private Interested Party	Richard Petersen	N/A
Private Interested Party	Richard West	N/A
Private Interested Party	Rob Marshall	N/A
Private Interested Party	Robert Adams	N/A
Private Interested Party	Robert Burke	N/A
Private Interested Party	Robert Garbarino	N/A
Private Interested Party	Robert Gibson	N/A
Private Interested Party	Robert Giusti	N/A
Private Interested Party	Robert Menard	N/A
Private Interested Party	Robert Rathborne	N/A
Private Interested Party	Robert Sack	N/A
Private Interested Party	Robert Saito	N/A
Private Interested Party	Robert Vogt	N/A
Private Interested Party	Robet Jamgochian	N/A
Private Interested Party	Roy Little	N/A
Private Interested Party	Rupeni Vuli	N/A
Private Interested Party	Ryan McGuigan	N/A
Private Interested Party	Ryan Rintala	N/A
Private Interested Party	Ryan White	N/A
Private Interested Party	Sabra Purdy	N/A
Private Interested Party	Sage Ono	N/A
Private Interested Party	Sam Scherck	N/A
Private Interested Party	Sam Todd	N/A
Private Interested Party	Sarah Brooks	N/A
Private Interested Party	Sarah Marr	N/A
Private Interested Party	Sarah Reith	N/A
Private Interested Party	Scott Anderson	N/A
Private Interested Party	Scott Bohannan	N/A
Private Interested Party	Scott Duncan	N/A
Private Interested Party	Scott Kitayama	N/A
Private Interested Party	Scott Newman	N/A
Private Interested Party	Scott Paulin	N/A
Private Interested Party	Scott Vogelsong	N/A

Organization	Name	Email or Street Address
Private Interested Party	Sean Thomas	N/A
Private Interested Party	Shane Connolly	N/A
Private Interested Party	Shane O’Brian	N/A
Private Interested Party	Shayna Williams	N/A
Private Interested Party	Shelley Villalobos	N/A
Private Interested Party	Simo Rodich	N/A
Private Interested Party	Sophie Jones	N/A
Private Interested Party	Spencer Perry	N/A
Private Interested Party	Stan Perry	N/A
Private Interested Party	Stephen Fioretti	N/A
Private Interested Party	Stephen Obrien	N/A
Private Interested Party	Stephen Rosenberg	N/A
Private Interested Party	Steve Lankenau	N/A
Private Interested Party	Steve Merlone	N/A
Private Interested Party	Steve Nelson	N/A
Private Interested Party	Steve Sandeen	N/A
Private Interested Party	Steve Schramm	N/A
Private Interested Party	Steve Sturken	N/A
Private Interested Party	Steven Hager	N/A
Private Interested Party	Steven Huntley	N/A
Private Interested Party	Steven Pettit	N/A
Private Interested Party	Steven Schloming	N/A
Private Interested Party	Stuart Weinstein	N/A
Private Interested Party	Susan Brown	N/A
Private Interested Party	Susan Knopf	N/A
Private Interested Party	Susan Swan	N/A
Private Interested Party	Svein Erik Kolstoe	N/A
Private Interested Party	Tanner Cremer	N/A
Private Interested Party	Teal Lehto	N/A
Private Interested Party	Terence Barton	N/A
Private Interested Party	Terry Nelson	N/A
Private Interested Party	Thomas Battle	N/A
Private Interested Party	Thomas Curran	N/A

Organization	Name	Email or Street Address
Private Interested Party	Thomas Riederer	N/A
Private Interested Party	Thomas Williams	N/A
Private Interested Party	Tim Burwell	N/A
Private Interested Party	Tim Chambers	N/A
Private Interested Party	Tim Howe	N/A
Private Interested Party	Tim Muzio	N/A
Private Interested Party	Tim Swan	N/A
Private Interested Party	Tim Thomas	N/A
Private Interested Party	Tim Todd	N/A
Private Interested Party	Timothy Devine	N/A
Private Interested Party	Timothy French	N/A
Private Interested Party	Todd Robinette	N/A
Private Interested Party	Tom Antczak	N/A
Private Interested Party	Tom Fahey	N/A
Private Interested Party	Tom Stoa	N/A
Private Interested Party	Tom Toretta	N/A
Private Interested Party	Tom Weseloh	N/A
Private Interested Party	Torrie Boles	N/A
Private Interested Party	Travis Massey	N/A
Private Interested Party	Tyanna Blaschak	N/A
Private Interested Party	Victoria Dimercurio	N/A
Private Interested Party	Virginia Graziani	N/A
Private Interested Party	Vladislav Tumanov	N/A
Private Interested Party	Walter Wood	N/A
Private Interested Party	Wayne Liquorman	N/A
Private Interested Party	Wendy Caminiti	N/A
Private Interested Party	Wendy Ring	N/A
Private Interested Party	Wes Lee	N/A
Private Interested Party	Whitney Royall	N/A
Private Interested Party	Whitney Vonfeldt	N/A
Private Interested Party	Will Fisher	N/A
Private Interested Party	Will Kluger	N/A
Private Interested Party	Will Randall	N/A

Organization	Name	Email or Street Address
Private Interested Party	Will Siegel	N/A
Private Interested Party	William Ballinger	N/A
Private Interested Party	William Bramley	N/A
Private Interested Party	William Joost Jr.	N/A
Private Interested Party	William L. Martin	N/A
Private Interested Party	William Newkirk	N/A
Private Interested Party	William Potts	N/A
Private Interested Party	William Spurzem	N/A
Private Interested Party	William Tinniswood	N/A
Private Interested Party	William Wolpert	N/A
Private Interested Party	Yvette Sack	N/A
Private Interested Party	Zephrin Lasker	N/A
Redwood Valley Vineyards	Martha Barra	N/A
Rice Forks Association	Nancy Horton	N/A
Riverbend Sciences	Eli Asarian	N/A
Rochioli Vineyard & Winery, LLC	Tom Rochioli	N/A
Russian River Property Owners	Adriane Garayalde	N/A
Saini Vineyards	John Saini	N/A
Steiner Environmental Consulting	Park Steiner	N/A
Stillwater Sciences	Abel Brumo	N/A
Stillwater Sciences	Dennis Halligan	N/A
Stillwater Sciences	Dirk Pederson	N/A
Thomas R. Johnson, LLC	Tom Johnson	N/A
Travel World Center	Dan York	N/A
UC Cooperative Extension	Glenn McGourty	N/A
UC Davis	Peter Moyle	N/A
UC Davis	Ron Yoshiyama	N/A
United Winegrowers for Sonoma County	Bob Anderson	N/A
Western Fishes Lamprey Project	Stewart Reid	N/A
Westshore Campers Association	Donna Stolz	N/A
Westshore Campers Association	Stacy Ledou	N/A

Notes:
N/A = Not available. Private information has been withheld.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Acronyms

DSOD	Division of Safety of Dams
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
ft.	foot/feet
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
RPA	Reasonable and Prudent Alternative
$yd.^3$	cubic yards

5.0 PROPOSED ACTION AND ALTERNATIVES

This section provides an overview of Pacific Gas and Electric Company's (PG&E's) No-Action Alternative, Proposed Action, and Alternatives for the surrender of the Potter Valley Hydroelectric Project (Federal Energy Regulatory Commission [FERC] Project No. 77), which are described in greater detail in Volume II, Section 2.

5.1 No-Action Alternative Overview

The No-Action Alternative is PG&E's existing Project and current operations under jurisdiction of FERC.

5.1.1 Existing Project Facilities

A list of the Project facilities in the Scott Dam Area and Cape Horn Dam Area is provided in Table 5-1. Physical characteristics and facility specifications of primary Project facilities in the Scott Dam and Cape Horn Dam areas are provided in Volume II, Table 2-3.

Table 5-1. Project facilities in the Scott Dam Area and Cape Horn Dam Area.

Project Facility/Feature
Dam and Associated Facility/Features
Scott Dam
Valve Control House
Reservoir
Lake Pillsbury (storage reservoir)
Reservoir Gage
E1—Lk Pillsbury NR Potter Valley CA (11470000)
River Gages
E2—Eel R BL Scott Dam NR Potter Valley CA (11470500)
Leakage Weirs and Piezometers and Associated Trail
Scott Dam Leakage Weirs
Scott Dam Piezometers
Scott Dam Piezometers and Leakage Weir Access Trail
Project Communication Line
Scott Dam Block Building Communication Line
Ancillary and Support Facilities
Scott Dam Block Building
Scott Dam Boat Barrier

Project Facility/Feature
Project Facility Access Roads
Gage E2 Access Rd
Scott Dam Rd
Upper Scott Dam Access Rd
Recreation Facilities and Access Roads
Family Campgrounds
Fuller Grove Campground
• Fuller Grove Campground Rd
Navy Campground
• Navy Campground Access Rd (18N50)
• Navy Campground Loop Rd
Oak Flat Campground
• Oak Flat Campground Rd
Pogie Point Campground
• Pogie Point Campground Loop Rd
• Pogie Point Campground and Day-Use Area Access Rd (18N75)
Sunset Point Campground
• Sunset Point Campground East Loop Rd
• Sunset Point Campground West Loop Rd
Group Campgrounds
Fuller Grove Group Campground
• Fuller Grove Group Campground Access Rd
Day-Use Facilities
Eel River Visitor Information Kiosk
Fuller Grove Day-Use Area and Boat Launch
• Fuller Grove Day-Use Area and Boat Launch Access Rd
Pillsbury Pines Day-Use Area and Boat Launch
• Pillsbury Pines Day-Use Area and Boat Launch Access Rd
Pogie Point Day-Use Area
Lake Pillsbury Low-Level Boat Launch
Dam and Associated Facility/Features
Cape Horn Dam
Cape Horn Dam Instream Flow Release

Project Facility/Feature
Reservoir
Van Arsdale Reservoir
Intake Structures
Van Arsdale Diversion Intake
Tunnels and Adits
Tunnel No. 1
Tunnel No. 2
Tunnel No. 1 Slide Gate and Adit
Tunnel No. 1 Gage Shaft
Conduits, Penstocks, and Control and Valve Houses
Conduit No. 1 (Upper Wood Stave, Steel Pipe, and Components)
Conduit No. 2 (Lower Wood Stave, Steel Pipe, and Components)
Conduit No. 1, 72-inch Butterfly Valve House
Conduit No. 1, Standpipe and Surge Chamber Vent
Penstock No. 1
Penstock No. 2
Penstock Nos. 1 and 2, 60-inch Gate Valves (2)
Penstock Bypass Channel
Powerhouse Bypass System
Powerhouse, Switchyard, and Tailrace
Potter Valley Powerhouse
Potter Valley Powerhouse Switchyard
Potter Valley Powerhouse Tailrace, Radial Gate, and Venturi Flume
Potter Valley Powerhouse Discharge Canal
Diversion Gages
E5—Potter Valley Irrig CN E5 NR Potter Valley CA (11471105)
E6—Potter Valley Irrig CN E6 NR Potter Valley CA (11471106)
E16—Potter Valley PH Intake near Potter Valley CA (11471000)
River Gages
E11—Eel River at Van Arsdale Dam near Potter Valley CA (11471500)
Leakage Weirs and Piezometers
Cape Horn Dam Leakage Weirs
Cape Horn Dam Piezometers
Fish Screen and Associated Facilities
Van Arsdale Fish Screen Facility
Van Arsdale Fish Screen Facility Backup Generator Building

Project Facility/Feature
Van Arsdale Fish Screen Facility Motor Control Building
Van Arsdale Fish Return Channel
Storage Building
Fish Ladder and Associated Facilities
Cape Horn Dam Fish Ladder Inlet / Outlet
Cape Horn Dam Fish Ladder
Fish Attraction Facility
Cape Horn Dam Fish Ladder Rockfall Fence
Cape Horn Dam Fish Ladder Intake / Outlet Debris Boom
Project Communication/Power Lines
Conduit No. 1, 72-inch Butterfly Valve House Communication Line
Cape Horn Dam Control Building Communication/Power Line
Fish Screen Facility Communication/Power Line
Tunnel No. 1 Slide Gate and Adit Communication/Power Line
Penstock Nos. 1 and 2, 60-inch Stop Valves Communication/Power Line
Helicopter Landing Sites
Potter Valley Powerhouse Helicopter Landing Site
Ancillary and Support Facilities
Potter Valley Powerhouse Operators Office
Potter Valley Powerhouse Maintenance Office
Potter Valley Powerhouse Operators Restrooms
Project Facility Access Roads
Cape Horn Dam East Access Rd
Intake Access Rd
Penstock, Pipeline, and Butterfly Valve House Access Rd (access for private landowner)
Powerhouse Main Access Rd
Project Facility Access Trails
Gage E11 Access Trail
Recreation Facilities and Access Roads
Family Campground
Trout Creek Campground
• Trout Creek Campground Loop Rd
Group Campground
Trout Creek Group Campground
• Trout Creek Campground Rd

5.1.2 Existing Project Operation

The Project is operated in compliance with existing regulatory requirements, agreements, and water rights to generate power and deliver consumptive water to local water users. The original license for the Project was issued effective April 15, 1922, and expired on April 14, 1972. From 1972 to 1983, the Project operated on annual licenses during the extended relicensing period. FERC issued a new license for the Project in 1983, which was amended in January 2004. The amended license expired on April 14, 2022. The Project is currently operating on annual licenses issued by FERC. Volume II, Table 2-6, provides a summary of the existing FERC license articles.

PG&E holds water rights for both power and consumptive uses. Water was diverted from the Eel River for generation at Potter Valley Powerhouse in the East Branch Russian River Watershed; generation at the powerhouse was discontinued in 2021. After passing through the Potter Valley Powerhouse, a portion of the powerhouse outflow is diverted via canals to the Potter Valley Irrigation District for consumptive use. The remaining outflow is abandoned to the East Branch Russian River. This abandoned water flows to Lake Mendocino and benefits downstream users. See Section 2.1.3.2 in Volume II for further information on PG&E's water rights.

5.1.3 Existing Environmental Measures

Project operations are regulated by requirements contained in: (1) the existing 1983 FERC license (FERC 1983); (2) the 2004 license amendment (FERC 2004), which incorporated the terms of the National Marine Fisheries Service's Reasonable and Prudent Alternative (RPA) (NMFS 2002); and (3) a 2007 operational "reinterpretation" of the terms of the 2002 RPA. The Project is further limited by PG&E's existing water rights and water supply agreement with the Potter Valley Irrigation District.

5.2 Applicant's Proposal Overview

PG&E's proposal consists of an Application for Surrender of License and an Application for Non-Project Use of Project Lands. This section summarizes the Proposed Action analyzed under each application. Additional detailed information can be found in Volume II, Section 2.2.

5.2.1 Surrender of License

The Proposed Action under the Application for Surrender of License (Proposed Action) includes the following:

- Decommissioning and removal of Scott Dam and associated facilities and features;
- Removal and restoration of certain Project recreational facilities (e.g., campgrounds, day-use facilities, recreation access roads and trails, a kiosk, and boat ramps) located on U.S. Forest Service and PG&E lands;
- Decommissioning and removal of Cape Horn Dam and associated facilities and features, except for limited components that will be needed for the NERF;

- Removal of New Eel-Russian Facility (NERF) facilities and lands from the existing FERC license; and
- Restoration of the remnant inundation zone of Lake Pillsbury and Van Arsdale Reservoir.

The Application for Surrender of License consists of a Conceptual Decommissioning Plan, which represents PG&E's recommendations for the decommissioning of Project facilities such that the Project will be removed from FERC and Division of Safety of Dams (DSOD) jurisdiction and will eliminate PG&E's generation capabilities.

5.2.1.1 Conceptual Decommissioning Plan

The Conceptual Decommissioning Plan includes the following:

- A concept-level description of the decommissioning of Project facilities/features and Project recreation facilities at the Scott Dam Area and at the Cape Horn Dam Area;
- A list of facilities that must be removed from the FERC license and transferred to the Eel-Russian Project Authority (ERPA) to allow for development of the NERF;
- A concept-level description of restoration activities to be implemented at Project dams and lake/reservoir and Project recreation facilities following completion of construction activities;
- A schedule for the proposed decommissioning and restoration activities; and
- A list of permits and other regulatory approvals required for implementation of the Conceptual Decommissioning Plan.

Proposed actions for dam and facility removal are provided for the Scott Dam Area and Cape Horn Dam Area below. PG&E is currently conducting the engineering analysis necessary for the development of detailed decommissioning plans for removal of Scott Dam, Cape Horn Dam, and Project recreation facilities. Following submittal of the Final Surrender Application and FERC's issuance of the Surrender Order, PG&E will provide detailed engineering plans for FERC review and approval.

Scott Dam Area

Decommissioning of Project facilities and features in the Scott Dam Area includes leaving facilities in place, removal of the facility with restoration, removal of the facility without restoration, and transfer of Project facilities necessary for the NERF to ERPA and removal from the FERC license. A summary of the decommissioning of Project facilities and features and Project recreation facilities is provided in Volume II, Table 2-8.

PG&E will implement the Rapid Dam Removal approach to decommission Scott Dam. Rapid Dam Removal entails expedited removal of Scott Dam (approximately 2 years in duration depending on site conditions and flows) such that no water is impounded and volitional fish passage and unimpaired flows will occur. The structure would no longer be under the jurisdiction of FERC or DSOD. Rapid Dam Removal would result in the flushing of a large volume of sediment (approximately 12 million cubic yards [yd.^{3}]) downstream of the remnant reservoir into the Eel River. The decommissioning activities would occur within three specific seasons: (1) *initial low-flow season* (June–October) to dewater and remove the upper portion of the dam, (2) *first high-flow season* following removal of the upper portion of the dam for sediment flushing (November–May), and (3) *first low-flow season* after sediment flushing to complete final dam removal. See Section 2.2.1.1 in Volume II for further information.

All Project recreation facilities (i.e., campgrounds and day-use areas) and associated access roads located in the Scott Dam Area will be removed, and the site will be restored. Construction will be confined to existing developed facility footprints and the construction area buffers as described in Table 2.9 in Section 2.1 in Volume II. PG&E plans to remove the recreation facilities simultaneously with dam removal activities. Helicopters may be necessary to transport material to and from the construction site.

Cape Horn Dam Area

PG&E would decommission the Project facilities such that the Project would be removed from FERC and DSOD jurisdiction and eliminate PG&E's generation capabilities. This includes Cape Horn Dam, Van Arsdale Reservoir, Potter Valley Powerhouse, and associated Project facilities and features including the tunnels, adits, conduits, and penstocks.

Decommissioning of Project facilities and features in the Cape Horn Dam Area includes leaving facilities in place, removal of the facility with restoration, removal of the facility without restoration, transfer of Project facilities necessary for the NERF to ERPA and removal from the FERC license, and transfer of the Project facility to a third party (other than ERPA) and removal from the FERC license. A summary of the decommissioning of Project facilities and features and Project recreation facilities is provided in Volume II, Table 2-10.

Removal of Cape Horn Dam would be completed in 12 to 18 months. Cape Horn Dam would be lowered to a level that will not impound water, allow for volitional fish passage and unimpaired Eel River flows, and allow for development of certain NERF facilities. Cape Horn Dam removal includes activities within two specific seasons: (1) *low-flow season* (March–October) to dewater, remove the dam and wingwall, and construct the NERF facilities and (2) *high-flow season* (November–May) to remove cofferdams, re-establish unimpaired flows downstream of the dam following in-water construction, and allow remaining sediments impounded in the former reservoir to naturally flush downstream during subsequent high-flow events.

Staging and stockpile areas necessary for the removal of the dam and decommissioning of facilities and features will be established on currently developed and disturbed areas within the construction area. Helicopters may be necessary to transport material to and from the construction site.

5.2.1.2 Conceptual Restoration Plan

Under the Proposed Action, PG&E will develop restoration plans to be implemented at Project dams and lake/reservoir and Project recreation facilities following completion of construction activities. The conceptual restoration plans will be included in the Final Surrender Application to be filed with FERC. Final restoration plans will be developed in collaboration with resource agencies following the filing of the Final Surrender Application. Final restoration plans would be updated, as necessary in consultation with resource agencies, following dam removal.

Table 5-2 provides the goals, by location, for the restoration plan. These goals would guide development of the conceptual restoration plans that would be included in the Final Surrender Application to be filed with FERC. Final restoration plans will be developed in collaboration with resource agencies following the filing of the Final Surrender Application.

Table 5-2. Restoration goals by location.

Location	Goal
Scott Dam Area	
Scott Dam	Stabilization of areas upstream and downstream of the former dam site, as appropriate, to prevent erosion
	Restoration of the Scott Dam work areas, staging areas, and areas where Project facilities/features were removed
	Reestablishment of channel conditions to support fish passage at the Scott Dam location.
Lake Pillsbury and Eel River from Scott Dam to Van Arsdale Reservoir	Conversion of lacustrine habitat to upland and riverine habitat
	Reestablishment/stabilization of the historical channels and floodplains of the Eel River, Rice Fork Creek, and other tributaries in the former reservoir
	Revegetation and stabilization of sediment in the former reservoir and upland areas in the former inundation zone, as necessary
	Reestablishment of fish passage in the Eel River (including critical riffles) and at downstream tributary confluences
	Reestablishment of fluvio-geomorphic and vegetation processes, sediment supply, and hydrology in the Eel River from Scott Dam to Van Arsdale Reservoir, including tributary passage
	Promotion of diverse aquatic habitat for fish and aquatic amphibians, reptiles, and invertebrates by allowing access to historical anadromous fish habitat upstream of the former dam and reestablishing fluvio-geomorphic processes
Recreation Facilities	Restoration (stabilization and revegetation) of Project recreation facility sites and associated construction work areas, staging areas, and stockpile areas
Cape Horn Dam Area	
Cape Horn Dam	Stabilization of areas upstream and downstream of the gravity portion of the dam site, as appropriate, to prevent erosion
	Restoration of the Cape Horn Dam work areas, staging areas, and areas where Project facilities/features were removed
	Revegetation and stabilization of sediment in the former inundation zone and upland area as necessary
	Reestablishment of fish passage at the remaining portion of Cape Horn Dam

Location	Goal
Van Arsdale Reservoir	Conversion of lacustrine habitat to a control section that would maintain a minimum bed elevation near the pump station intake screens within the former Van Arsdale Reservoir
	Reestablishment of fish passage in the Eel River and at downstream tributary confluences (downstream of Cape Horn Dam), if necessary
	Reestablishment of channel in the former Van Arsdale Reservoir
	Revegetation and stabilization of sediment in the former reservoir, including upland areas, as necessary
	Reestablishment of sediment transport and hydrology in the Eel River downstream of Cape Horn Dam, including tributary passage
	Promotion of diverse aquatic habitat for fish and aquatic amphibians, reptiles, and invertebrates by reestablishing fluvio-geomorphic processes

5.2.1.3 Decommissioning and Restoration Schedule

The decommissioning and restoration schedule is contingent on issuance of a Surrender Order and associated conditions for the Project. In general, decommissioning and restoration activities would follow a phased approach, as noted below:

- Pre-construction Activities:
  - Development of Final Engineering Plans
  - Development and Agency Review and Approval of Final Restoration Plans
  - Environmental Permitting
  - FERC Approval of the Engineering Design
- Scott Dam Area Construction:
  - Scott Dam and Associated Project Facility/Feature Removal
  - Recreation Facility Removal
- Scott Dam Area and Recreation Facility Restoration
- Cape Horn Dam Area Construction:
  - Cape Horn Dam and Associated Project Facility/Feature Removal
- Cape Horn Dam Area Restoration

It is anticipated that the decommissioning of Scott Dam and associated Project facilities/features would require 2 years (depending on site conditions and flows) and the removal of Cape Horn Dam and decommissioning of associated Project facilities/features would take two construction seasons (*low-flow* and *high-flow* seasons). PG&E plans to remove the recreation facilities simultaneously with dam removal activities. The duration of construction may change based on final engineering design.

5.2.2 Non-Project Use of Project Lands

The Proposed Action under the Application for Non-Project Use of Project Lands (NPUPL Proposed Action) includes authorization to allow ERPA to construct the NERF on lands within the FERC Project boundary. The NERF facility includes a pump station to divert and convey water to the existing Van Arsdale tunnel inlet, a retaining wall, placement of fill behind the retaining wall, and modification of the Potter Valley Powerhouse. Other construction activities associated with the NERF and future operation of the facility by ERPA will require separate environmental analysis and permits/approvals to be completed by ERPA.

5.2.2.1 Conceptual Construction Plan of the NERF Facility

ERPA would construct a new pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River. Construction of the NERF retaining wall, pump station, and conduit from the pump station to the tunnel inlet; placement of fill behind the wall; and modification of the Potter Valley Powerhouse would occur during the *low-flow season* (May–October) when the area is dewatered for the removal of Cape Horn Dam. The cofferdams would be removed as part of the Surrender Application following PG&E's decommissioning work at Cape Horn Dam and construction of the NERF retaining wall and new pump station.

The construction area for development of the NERF and modification of the Potter Valley Powerhouse includes all areas necessary for construction of these facilities, including the construction work area, staging areas, and stockpile areas. Helicopters may be necessary to transport material to and from the construction site. See Section 2.2.2.1 for details on NERF construction actions.

ERPA is currently conducting the engineering analysis necessary for the development of a detailed construction plan. Following submittal of the Final Application for Non-Project Use of Project Lands and FERC's issuance of the Surrender Order, PG&E would provide detailed construction plans for FERC review and approval.

5.2.2.2 Schedule

Construction of the NERF pump station and retaining wall, placement of fill behind the retaining wall, and modification of the Potter Valley Powerhouse are contingent on issuance of a Surrender Order to authorize diversion and dewatering of the Eel River and removal of Cape Horn Dam and FERC authorization of Non-Project Use of Project Lands.

Final engineering plans, environmental permitting, and FERC approval of the final engineering design would be completed prior to construction. Construction of the NERF pump station, retaining wall, and conduit from the pump station to the tunnel inlet; placement of fill behind the retaining wall; and modification of the Potter Valley Powerhouse would be completed within the same time period as PG&E's removal of Cape Horn Dam and associated Project facilities and features. The construction season would extend from approximately March 1 to October 31 depending on weather conditions.

Following construction of the NERF retaining wall, pump station, and conduit from the pump station to the tunnel inlet; and modification of the Potter Valley Powerhouse, as well as PG&E's decommissioning of Cape Horn Dam and filing of a completion report with FERC, all necessary facilities and lands for the NERF would be removed from the FERC license. Under a separate environmental review process, ERPA would obtain all necessary permits and approvals for additional construction activities and to allow for operation of the NERF and continued diversion to the East Branch Russian River.

5.2.3 Proposed Environmental Measures

The lists of plans and measures to be implemented during decommissioning (construction) activities implemented under the Proposed Action for the Surrender Application and Non-Project Use of Project Lands Application (NPUPL Proposed Action), as well as following removal of the Project dams and associated facilities/features and recreation facilities, are provided in Section 2.2.3. The goals and objectives for each plan and measures are provided; the plans and measures will be fully developed after PG&E's FERC filing in July 2025.

5.3 Alternatives Considered but Eliminated from Further Analysis

Two alternative dam removal strategies were considered and were eliminated from further analysis: a Phased Scott Dam Removal Alternative and a Cape Horn Dam Removal without NERF Alternative.

5.3.1 Phased Scott Dam Removal Alternative

The Phased Scott Dam Removal Alternative would entail successive lowering and notching of Scott Dam over three seasons such that sediment would be flushed from the reservoir downstream into the Eel River during high flows in pulses, over consecutive years.

- **Year 1 Low-flow Season Activities: June–October**
  - Initiate reservoir drawdown of between 1 and 2 feet (ft.) per day after the runoff season when inflows are generally below 400 cubic feet per second.
  - Implement road improvements on Scott Dam Road and Upper Scott Dam Road.
  - Initiate dam lowering and notching to 1,850 ft. in elevation using barge-mounted machinery, including creating a spillway notch sufficient to convey the anticipated high winter and spring flows.
- **Year 1 High-flow Season Activities: November–May**
  - Flush approximately 1.1 million $yd.^3$ of stored sediment from the reservoir through the dam notch during high flows (assuming a 50-ft.-wide notch).
- **Years 2 and 3 Low-flow Season Activities: June–October**
  - Continue to lower and notch the dam during two subsequent low-flow construction seasons: first to an elevation of 1,830 ft. (20 ft. of lowering the second year) and then to an elevation of 1,810 ft. (an additional 20 ft. of lowering the third year).

- **Years 2 and 3 High-flow Season Activities: November–May**
  - Continue to flush sediment from the reservoir through the dam notch during high flows: 8.5 million $yd.^3$ in year 2 and 2.4 million $yd.^3$ in year 3.
- **Year 4 Low-flow Season: June–October**
  - Final dam removal after three successive low-flow period dam lowering/notching and high-flow sediment flushing events.

Ultimately, the dam would no longer impound water and would be removed from FERC and DSOD jurisdiction. Under this alternative, sediment would be released from the dam during more than one year. This would result in increased turbidity and suspended sediment and adversely impact water quality parameters that would affect environmental and cultural resources below Scott Dam over a longer duration compared to the Proposed Action. As this alternative would not eliminate the potential for unavoidable adverse effects to environmental resources compared to the Proposed Action and would not meet PG&E's interest to remove the dams as quickly as possible, it has been eliminated from further consideration.

5.3.2 Cape Horn Dam Removal without NERF Alternative

The Cape Horn Dam Removal without NERF Alternative would only include removal of Cape Horn Dam and associated facilities and features. After the removal of Scott Dam, PG&E would no longer be able to divert flows to the East Branch Russian River. As part of the Surrender Application, PG&E is requesting that FERC include a condition in the Surrender Order to remove Project lands and facilities occupied by the NERF from the FERC license once (1) PG&E has completed decommissioning work at Cape Horn Dam and other project works associated with the NERF, (2) the NERF retaining wall and new pump station have been constructed, and modifications at the Potter Valley Powerhouse have been completed, and (3) PG&E has filed a completion report to FERC on these actions This would allow for the construction of the NERF to allow for future Russian River water diversion out of FERC's regulatory authority. ERPA will be responsible for the future construction, operation, and maintenance of this new facility. In addition, under the Proposed Action, PG&E's decommissioning activities at Cape Horn Dam and ERPA's NERF construction would be closely coordinated and would occur during the same construction season. This will reduce potential construction-related impacts, including dewatering and downstream water quality issues, to Endangered Species Act threatened Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) and other special-status aquatic species in the Eel River.

While decommissioning the Project is the most important goal for PG&E, inclusion of the NERF in PG&E's Surrender Application and Decommissioning Plan is seen as the least environmentally impactful and most efficient approach from a regulatory schedule and public policy perspective for the decommissioning of PG&E's Project and the construction of the NERF. Therefore, the Cape Horn Dam Removal without NERF Alternative has been eliminated from further consideration.

5.4 References

FERC (Federal Energy Regulatory Commission). 1983. Opinion and Order Denying Appeal, Approving Settlement, and Issuing New License. October 4.

FERC (Federal Energy Regulatory Commission). 2004. Order Amending License. January 28.

NMFS (National Marine Fisheries Service). 2002. Biological Opinion for the Proposed License Amendment for the Potter Valley Project (FERC Project No. 77-110). Southwest Region. November 26.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

APE	area of potential effects
CFR	Code of Federal Regulations
Commission	Federal Energy Regulatory Commission
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
FYLF	foothill yellow-legged frog
mi.	miles
MOA	Memorandum of Agreement
NERF	New Eel-Russian Facility
PA	Programmatic Agreement
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
SHPO	State Historic Preservation Office

6.0 CONCLUSIONS AND RECOMMENDATIONS

Pacific Gas and Electric Company (PG&E) proposes to surrender the Federal Energy Regulatory Commission (FERC) license for and decommission the Potter Valley Hydroelectric Project (FERC Project No. 77) (Project) in accordance with the Proposed Action. PG&E proposes to continue consultation with the appropriate federal, state, and local agencies.

Conclusions and recommendations from the environmental analyses and consultations conducted for the Project are provided herein. This section will be updated in the Final Surrender Application with agency and stakeholder feedback provided during review of this Draft Surrender Application.

6.1 Applicant-proposed Measures

PG&E's Proposed Action includes measures and plans to be implemented during decommissioning (construction and deconstruction) activities under the Proposed Action for the Surrender Application and during construction activities implemented under the Non-Project Use of Project Lands Application (Section 2.2.3.1), as well as environmental measures that will be implemented following removal of the Project dams and associated facilities/features and recreation facilities (Section 2.2.3.2).

Final measures and plans will be developed in consultation with resource agencies and other interested parties following PG&E's filing of the Final Application of Surrender of License and Non-Project Use of Project Lands in July 2025.

6.2 Agency- and Stakeholder-proposed Measures

With the distribution of this Draft Surrender Application, PG&E seeks agency and stakeholder input on appropriate resources measures to be considered by PG&E and FERC as the Project is decommissioned. Comments on the Draft Surrender Application will be considered in development of the Final Surrender Application.

6.3 Unavoidable Adverse Impacts

6.3.1 Application for Surrender of License

Unavoidable adverse effects from construction and deconstruction of Project facilities (Phase 1) and post-facility removal (Phase 2)[1] to resources are described below, organized by resource area. These are the expected effects that would remain after implementation of proposed environmental measures.

6.3.1.1 Water Use and Hydrology

- Unavoidable adverse effect on the Potter Valley Irrigation District water supply because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phases 1 and 2).
- Unavoidable adverse effect on existing condition hydrology in the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action, but flows would return to natural flow conditions (Phase 2).

6.3.1.2 Water Quality

- Short-term unavoidable adverse effect on suspended sediment and turbidity in Lake Pillsbury and the Eel River downstream of Scott Dam as a result of reservoir dewatering, dam lowering, and dredging during Scott Dam deconstruction (Phase 1).
- Short-term unavoidable adverse effect on suspended sediment and turbidity in the Eel River from removal of the dams for a period of several days up to several months for which no mitigation is possible (Phase 2a).
  - This effect is likely to extend along the entire length of the Eel River, including the estuary and the nearshore ocean environment.
  - This action would also have a smaller long-term effect of increased turbidity during high-flow events as the remainder of the sediments are remobilized and carried out to the ocean for 1 to 3 years.

[1] The effects analysis is organized into two phases within each resource area—Construction and Deconstruction Effects (Phase 1) and Post-facility Removal Effects (Phase 2) (see Section 3.4.1.1). Post-facility removal has been further defined to include two phases—Phase 2a and Phase 2b. Phase 2a, Initial Conditions and Preliminary Restoration, includes the initial temporary physical conditions that will occur immediately following dam and ancillary/recreation facility removal. Phase 2b, Resulting Conditions and Restoration, includes the resulting conditions following dam and ancillary/recreation facility removal including unimpaired hydrology and the restored sediment transport and water quality in the Eel River downstream of Scott and Cape Horn dams, restored former reservoir beds, and natural hydrology in the East Branch Russian River.

- Short-term unavoidable adverse effect on dissolved oxygen in the Eel River from Scott Dam removal for a period of several days and as far as 40–50+ miles (mi.) downstream from Scott Dam for which no mitigation is possible (Phase 2a).
  - The impact on dissolved oxygen of removing the Cape Horn cofferdams would be moderate, and as it would happen in the same season with the removal of Scott Dam, it would likely be masked by the larger impact from upstream once the flows reach the Cape Horn Dam area a few hours following the adit blast.
- Short-term (1 to 3 years) unavoidable adverse effect on water quality in the Eel River from removal of Scott Dam due to high nutrient levels, which could be accompanied by higher chlorophyll-a and algal toxins due to algal blooms (Phase 2a).
- Long-term unavoidable adverse effect on existing cold-water conditions in the Eel River from below Scott Dam to below Cape Horn Dam a few miles compared to the No-Action Alternative due to increased spring and summer water temperature from removal of the dams (Phase 2b).
  - While the resulting condition and restoration of Eel River compared to unimpaired conditions would have an unavoidable adverse effect on water temperature, the change to natural conditions, overall, is considered to be a positive effect on the Eel River. In addition, the removal of the dams would improve access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam.
- Long-term unavoidable adverse effect on existing water temperature conditions in the East Branch Russian River compared to the No-Action Alternative due to increased spring and summer water temperatures because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2b).
  - This change in water temperature would be similar to unimpaired conditions.

6.3.1.3 Fish and Aquatic Resources

- Short-term unavoidable adverse effect to fish and aquatic resources from the release of non-native species, including Sacramento pikeminnow (*Ptychocheilus grandis*) and largemouth bass (*Micropterus salmoides*), from Lake Pillsbury into the Eel River during winter spill events following the lowering of Scott Dam and during the release of storage and sediment from Scott Dam (Phases 1 and 2a).
- Short-term unavoidable adverse effect to fish and aquatic resources from removal of fish capture/management infrastructure at Cape Horn Dam prior to an entire year class (cohort) of Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), and Pacific lamprey (*Entosphenus tridentatus*) arriving at Cape Horn Dam could result in loss of the entire cohort and jeopardize the ability to implement Construction Aquatic Species Management and Monitoring Plan measures to provide fish salvage, capture, relocation, and broodstock rescue (Phase 1).
  - In the long term, removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam in the Eel River.

- Short-term unavoidable significant adverse effect to fish and aquatic resources from the direct loss of all fish and aquatic species (special-status and native) in at least 50 mi. of the Eel River below Scott Dam due to low dissolved oxygen during the release of sediment from Lake Pillsbury and Van Arsdale Reservoir (special-status species include Chinook salmon, steelhead, Pacific lamprey, foothill yellow-legged frog (*Rana boylii*), northwestern pond turtle (*Actinemys marmorata*), western pearlshell mussels (*Margaritifera falcata*), lamprey spp., green sturgeon (*Acipenser medirostris*), and coho salmon (*Oncorhynchus kisutch*) (Phase 2a).
  - In the long term, removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam and restoring natural hydrology and sediment processes in the Eel River.
- Short-term unavoidable adverse effect to fish and aquatic resources from the direct loss of a percentage of fish and aquatic species (special-status and native) along the 168.5 mi. of the Eel River below Scott Dam, including the estuary, due to high suspended sediment concentrations during the release of sediment from Lake Pillsbury and Van Arsdale Reservoir (special-status species include Chinook salmon, steelhead, Pacific lamprey, FYLF, northwestern pond turtle, western pearlshell mussels, lamprey spp., green sturgeon, coastal cutthroat trout (*Oncorhynchus* sp.), coho salmon, and species in the lower Eel River and estuary) (Phase 2a).
  - In the long term, removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam and restoring natural hydrology and sediment processes in the Eel River.
- Short-term unavoidable adverse effects to fish and aquatic resources resulting from sediment deposition in channel pools and spawning habitats in the Eel River as a result of releasing accumulated sediment from Lake Pillsbury and Scott Dam (Phase 2a).
- Long-term unavoidable adverse effects to fish and aquatic resources in the East Branch Russian River from the loss of special-status species (FYLF, northwestern pond turtle, western pearlshell mussels) because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2a and Phase 2b).

6.3.1.4 Botanical Resources

- Potential temporary effects to eelgrass (*Zostera marina*) communities in the Eel River estuary from suspended fine sediment load from removal of the dams (Phase 2a).
- Potential alteration of riparian and wetland habitat along the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2).

6.3.1.5 Wildlife Resources

- Bald eagle (*Haliaeetus leucocephalus*):
  - Potential nest abandonment at Scott Dam and Cape Horn Dam from the noise of construction activities (Phase 1).
  - Reduction in foraging habitat quality at Cape Horn Dam from construction activities (Phase 1).
  - Potential nest territory abandonment from loss of Lake Pillsbury following facility removal (Phase 2).
  - Potential nest territory abandonment from changes to foraging habitat in Van Arsdale Reservoir following facility removal (Phase 2).
  - Adverse effects to fish prey resources from the release of sediments into the Eel River following dam removal (Phase 2a).
- Northern spotted owl (*Strix occidentalis caurina*):
  - Potential nest abandonment in the Scott Dam Area from construction activities (Phase 1).
- Other raptors:
  - Potential nest abandonment at Scott Dam and Cape Horn Dam from the noise of construction activities (Phase 1).
  - Alteration of osprey (*Pandion haliaetus*) foraging habitat from the loss of Lake Pillsbury following Scott Dam removal (Phase 2).
  - Adverse effects to fish prey resources for osprey from the release of sediments into the Eel River following dam removal (Phase 2a).
  - Alteration of aquatic foraging habitat for osprey in the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2).
- Other special-status birds or game birds:
  - Loss of lacustrine foraging habitat for waterfowl from loss of Lake Pillsbury following facility removal (Phase 2).
  - Alteration of aquatic, riparian, wetland, and agricultural nesting and foraging habitat for tricolored blackbird (*Agelaius tricolor*) along the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2).
- Special-status mesocarnivores:[2]
  - Potential disturbance to dens from construction or restoration activities (Phase 1).

[2] An animal whose diet consists of 30–70 percent meat with the balance consisting of non-vertebrate foods such as insects, fungi, fruits, and plant materials.

- Tule elk (*Cervus canadensis nannodes*) and other game mammals:
  – Potential shifts in behavior resulting from noise disturbance during implementation of restoration activities in the former lakebed of Lake Pillsbury (Phase 2a).
  – Potential stranding in exposed sediments within the former Lake Pillsbury and in the Eel River immediately downstream of the dams (Phase 2).
  – Alteration of riparian, wetland, and agricultural foraging habitat in the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2).

6.3.1.6 Geology & Soils

- Long-term unavoidable adverse effects from the loss of Lake Pillsbury could lower groundwater levels in the vicinity of the reservoir and potentially affect local groundwater wells (Phase 2).

6.3.1.7 Geomorphology

- Temporary unavoidable alteration of the Eel River channel or floodplain morphology from sediment deposition after removal of the dams until subsequent high-flow events can resuspend the sediment and transport it farther downstream (Phase 2a).
- Potential short-term unavoidable adverse effects to impact infrastructure located downstream of Scott Dam and Cape Horn Dam from sediment deposition (Phase 2a).
- Potential short-term unavoidable adverse effects to other infrastructure along the river, such as water intakes or diversions being buried or plugged and becoming inoperable or requiring ongoing management due to sediment deposition (Phase 2a).

6.3.1.8 Land Use

- Potential unavoidable adverse effects to local fire suppression to properties near Lake Pillsbury due to the replacement of Lake Pillsbury with the Eel River or other sources as a water source, resulting in potentially longer fire response times (Phase 2).

6.3.1.9 Recreation

- Short-term loss of recreation opportunities during construction at Lake Pillsbury from the drawdown of Lake Pillsbury and restricted recreation use (Phase 1).
- Loss of recreation opportunities at Lake Pillsbury with the removal of PG&E recreation facilities and ancillary features (permanent loss) (Phase 2).
- Loss of reservoir-based recreation at Lake Pillsbury with the transition of a lacustrine to riverine environment (Phase 2). Implementation of the Restoration Plan would ensure that the Eel River is restored in the former reservoir bed, which would result in conditions favorable for river-based recreation over the long term.

- Potential short-term, temporary effects to fishing and watercraft opportunities in the Eel River from high suspended sediment load and aquatic biota mortality (Phase 2a).
- Potential reduction in fishing, watercraft, and swimming opportunities in the East Branch Russian River during low summer flows because water would no longer be diverted to the East Branch Russian River under the Proposed Action (Phase 2).

6.3.1.10 Cultural Resources

- Unavoidable adverse effects to cultural resources if effects cannot be avoided or resolved through the Section 106 process. The process for resolving adverse effects or Finding of Adverse Effect will follow the Section 106 process pursuant to 36 Code of Federal Regulations (CFR) Part 800.5 for *assessment of adverse effects* and 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with the State Historic Preservation Office (SHPO), Tribes, interested parties, and land-managing agencies; and developing a Section 106 agreement document (typically a Memorandum of Agreement [MOA] or Programmatic Agreement [PA] that resolves adverse effects).

6.3.1.11 Tribal Resources

- Unavoidable adverse effects to Tribal resources if effects cannot be avoided or resolved through the Section 106 process. The process for resolving adverse effects or Finding of Adverse Effect will follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with SHPO, Tribes, interested parties, and land-managing agencies; and developing a Section 106 agreement document (typically an MOA or a PA) that resolves adverse effects.
  – In the long term, removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam and restoring natural hydrology and sediment processes in the Eel River.

6.3.1.12 Socioeconomics

- The removal of Scott Dam would result in a change from a lacustrine to riverine environment at Lake Pillsbury and a return to unimpaired Eel River flows that may result in changes in and could have unavoidable effects on recreation value, community way of life, and population and housing in the Scott Dam area. These effects may be offset by restoration (Phase 2).
- In the Russian River Watershed, there may be unavoidable adverse impacts to water reliability and cost, economic opportunity (particularly farming and ranching), recreation value in the Russian River Watershed, and community way of life because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phases 1 and 2).

6.3.1.13 Noise

- Temporary and brief unavoidable adverse noise effects at noise-sensitive areas associated with the use of off-road construction equipment and helicopters during construction (Phase 1).

6.3.1.14 Marine Resources

- Short-term, temporary elevated suspended sediment concentrations would extend along the entire length of the Eel River and Eel River estuary and into the ocean that may affect marine resources (Phases 1 and 2).
  - In the long term, suspended sediment and turbidity would return to unimpaired conditions, with high-flow events transporting watershed-derived suspended sediment out to the ocean.
- Short-term unavoidable adverse effects to salmonids and other fish and aquatic organisms, which could include mortality and impaired function, from the initial release of sediment and reduction of dissolved oxygen concentrations downstream of the dam (Phases 1 and 2).
  - In the long term, suspended sediment and turbidity would return to unimpaired conditions, with high-flow events transporting watershed-derived suspended sediment out to the ocean.

6.3.2 Application for the Non-Project Use of Project Lands

Construction of the New Eel-Russian Facility (NERF) would have potentially unavoidable adverse impacts on water use and hydrology, fish and aquatic resources, wildlife resources, channel geomorphology, and cultural and Tribal resources.

6.3.2.1 Water Use and Hydrology

- Any temporary and short-term cessation of diversions to the East Branch Russian River during construction of the NERF would have an adverse effect on its hydrology.

6.3.2.2 Fish and Aquatic Resources

- Permanent unavoidable adverse effect on critical habitat and essential fish habitat for Endangered Species Act threatened California Coastal Evolutionarily Significant Unit Chinook salmon and Northern California Distinct Population Segment steelhead within Van Arsdale Reservoir due to the placement of fill. The Eel-Russian Project Authority (ERPA) would obtain permits and adhere to any required compensatory mitigation measures included in these permits.
- Permanent unavoidable adverse effect on the habitat for other special-status species (FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) and native species (e.g., Sacramento sucker) within Van Arsdale Reservoir due to the placement of fill. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

6.3.2.3 Wildlife Resources

- Potential effects to bald eagles and other raptors from potential nest abandonment at the New Pump Station Construction Area due to construction noise.
- Potential disturbance to special-status mesocarnivores[3] from construction noise and activities.

6.3.2.4 Geomorphology

- Potential unavoidable adverse effect on about 290 feet of the Eel River channel in the NERF construction footprint. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

6.3.2.5 Cultural Resources

- Unavoidable adverse effects would be likely if cultural resources are identified in the proposed construction areas of the NERF and subsequent area of potential effects (APE) that cannot be avoided. FERC, PG&E, ERPA, and permitting agencies would be required to follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and Part 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with SHPO, Tribes, interested parties, and land-managing agencies; and developing a Section 106 agreement document (typically an MOA or a PA) that resolves adverse effects.

6.3.2.6 Tribal Resources

- Unavoidable adverse effects would be likely if Tribal resources and archaeological sites that qualify as Tribal resources are identified in the proposed construction areas of the NERF and subsequent APE that cannot be avoided. FERC, PG&E, ERPA, and permitting agencies would be required to follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and Part 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with SHPO, Tribes, interested parties, and land-managing agencies; and developing a Section 106 agreement document (typically an MOA or a PA) that resolves adverse effects.

3 An animal whose diet consists of 30–70 percent meat with the balance consisting of non-vertebrate foods such as insects, fungi, fruits, and plant materials.

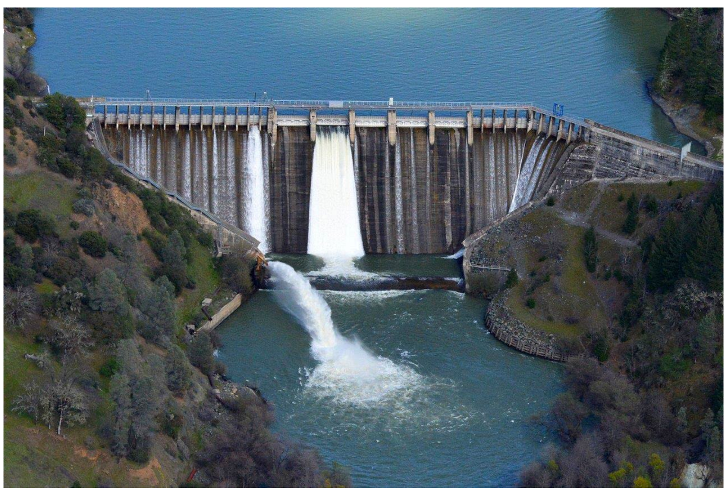
This Page Intentionally Left Blank

PACIFIC GAS AND ELECTRIC COMPANY

Potter Valley Hydroelectric Project
(FERC Project No. 77)

Draft Application for Surrender of License and Application for Non-Project Use of Project Lands

VOLUME II
EXHIBIT E PUBLIC INFORMATION



Scott Dam

Cape Horn Dam

January 2025

This Page Intentionally Left Blank

PACIFIC GAS AND ELECTRIC COMPANY

POTTER VALLEY HYDROELECTRIC PROJECT
(FERC Project No. 77)

Draft Application for Surrender of License and Application for Non-Project Use of Project Lands

Volume II
Exhibit E Public Information

January 2025

PG&E

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Figures

List of Maps

List of Acronyms

ac-ft	acre-feet
afa	ac-ft per annum
BMP	best management practice
CDFW	California Department of Fish and Wildlife
cfs	cubic feet per second
cy	cubic yard
DSOD	Division of Safety of Dams
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
ft.	feet/foot
in.	inch(es)
kV	kilovolt
kVA	kilo-volt-ampere
kW	kilowatt
NAVD88	National Geodetic Vertical Datum of 1988
NERF	New Eel-Russian Facility
NGVD29	National Geodetic Vertical Datum of 1929
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company
PLC	Programmable Logic Controller
Project	Potter Valley Hydroelectric Project
PVID	Potter Valley Irrigation District
RPA	Reasonable and Prudent Alternative
RPM	revolutions per minute
SHPO	State Historic Preservation Officer
Surrender Application	Draft Surrender Application and Conceptual Decommissioning Plan
SWDU	Statement of Water Diversion and Use

USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSD	U.S. Society on Dams

This Page Intentionally Left Blank

1.0 INTRODUCTION

Pacific Gas & Electric Company (PG&E) has prepared a Draft Surrender Application and Conceptual Decommissioning Plan (Surrender Application) for the Potter Valley Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 77) consistent with 18 Code of Federal Regulations §6.1. PG&E will release the Draft Surrender Application to stakeholders (i.e., agencies, Tribes, non-governmental organizations, and interested public) for a 30-day review and comment period. Comments on the Draft Surrender Application will be considered in development of the Final Surrender Application, which will be filed with the FERC in the same form and manner as an application for license.

PG&E's goals upon conclusion of the decommissioning process are to (1) remove the Project facilities and features including but not limited to Scott Dam and Cape Horn Dam, (2) remove the Project from FERC and Division of Safety of Dams jurisdiction; and (3) no longer operate or maintain the Project and Project features in the future.

The Proposed Action under the Application for Surrender of License (Project Action) includes:

- Decommissioning and removal of Scott Dam and associated facilities and features;
- Removal and restoration of Project recreational facilities (e.g., campgrounds, day-use facilities, recreation access roads and trails, kiosk, and boat ramps) located on U.S. Forest Service (USFS) and PG&E lands;
- Decommissioning and removal of Cape Horn Dam and associated facilities and features;
- Removal of New Eel-Russian Facility (NERF) facilities and lands from the existing FERC license; and
- Restoration of the remnant inundation zone of Lake Pillsbury and Van Arsdale Reservoir.

The Proposed Action under the Application for Non-Project Use of Project Lands (NPUPL Proposed Action) includes:

- Authorization for construction of the new NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River, a conduit from the pump station to the tunnel inlet, retaining wall, and modification of the Potter Valley Powerhouse.

An overview of the Project location is provided in Volume I, Section 1.0.

This Page Intentionally Left Blank

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 No-Action Alternative

This section describes PG&E's Project and current operations.

2.1.1 Existing Project Facilities

This section describes Project facilities under FERC jurisdiction. A list of Project facilities in the Scott Dam Area is provided in Table 2-1, and a list of Project facilities in the Cape Horn Dam Area is provided in Table 2-2. Physical characteristics and facility specifications of primary Project facilities in the Scott Dam and Cape Horn Dam areas are provided in Table 2-3. Map 2-1 provides a geographic overview of the Project; Map 2-2 shows land ownership and recreation facilities; Map 2-3 provides an overview of the Eel River and Russian River watersheds; and Maps 2-4 through 2-7 provide a detailed geographic depiction of Project facilities. Figure 2-1 includes a schematic showing piping details of Project facilities entering, within, and exiting the powerhouse.

Table 2-1. Project facilities in the Scott Dam Area.

Project Facility/Feature
Dam and Associated Facility/Features
Scott Dam
Valve Control House
Reservoir
Lake Pillsbury (storage reservoir)
Reservoir Gage
E1—Lk Pillsbury NR Potter Valley CA (11470000)
River Gages
E2—Eel R BL Scott Dam NR Potter Valley CA (11470500)
Leakage Weirs and Piezometers and Associated Trail
Scott Dam Leakage Weirs
Scott Dam Piezometers
Scott Dam Piezometers and Leakage Weir Access Trail
Project Communication Line
Scott Dam Block Building Communication Line
Ancillary and Support Facilities
Scott Dam Block Building
Scott Dam Boat Barrier

Project Facility/Feature
Project Facility Access Roads
Gage E2 Access Rd
Scott Dam Rd
Upper Scott Dam Access Rd
Recreation Facilities and Access Roads
Family Campgrounds
Fuller Grove Campground
• Fuller Grove Campground Rd
Navy Campground
• Navy Campground Access Rd (18N50)
• Navy Campground Loop Rd
Oak Flat Campground
• Oak Flat Campground Rd
Pogie Point Campground
• Pogie Point Campground Loop Rd
• Pogie Point Campground and Day-Use Area Access Rd (18N75)
Sunset Point Campground
• Sunset Point Campground East Loop Rd
• Sunset Point Campground West Loop Rd
Group Campgrounds
Fuller Grove Group Campground
• Fuller Grove Group Campground Access Rd
Day-Use Facilities
Eel River Visitor Information Kiosk
Fuller Grove Day-Use Area and Boat Launch
• Fuller Grove Day-Use Area and Boat Launch Access Rd
Pillsbury Pines Day-Use Area and Boat Launch
• Pillsbury Pines Day-Use Area and Boat Launch Access Rd
Pogie Point Day-Use Area
Lake Pillsbury Low Level Boat Launch

Table 2-2. Project facilities in the Cape Horn Dam Area.

Project Facility/Feature
Dam and Associated Facility/Features
Cape Horn Dam
Cape Horn Dam Instream Flow Release
Reservoir
Van Arsdale Reservoir
Intake Structures
Van Arsdale Diversion Intake
Tunnels and Adits
Tunnel No. 1
Tunnel No. 2
Tunnel No. 1 Slide Gate and Adit
Tunnel No. 1 Gage Shaft
Conduits, Penstocks, Control and Valve Houses
Conduit No. 1 (Upper Wood Stave, Steel Pipe and Components)
Conduit No. 2 (Lower Wood Stave, Steel Pipe and Components)
Conduit No. 1, 72-in. Butterfly Valve House
Conduit No. 1 Standpipe and Surge Chamber Vent
Penstock No. 1
Penstock No. 2
Penstock Nos. 1 and 2, 60-in. Gate Valves (2)
Penstock Bypass Channel
Powerhouse Bypass System
Powerhouse, Switchyard, and Tailrace
Potter Valley Powerhouse
Potter Valley Powerhouse Switchyard
Potter Valley Powerhouse Tailrace, Radial Gate, and Venturi Flume
Potter Valley Powerhouse Discharge Canal
Diversion Gages
E5—Potter Valley Irrig CN E5 NR Potter Valley CA (11471105)
E6—Potter Valley Irrig CN E6 NR Potter Valley CA (11471106)
E16—Potter Valley PH Intake near Potter Valley CA (11471000)
River Gages
E11—Eel River at Van Arsdale Dam near Potter Valley CA (11471500)
Leakage Weirs and Piezometers
Cape Horn Dam Leakage Weirs
Cape Horn Dam Piezometers

Project Facility/Feature
Fish Screen and Associated Facilities
Van Arsdale Fish Screen Facility
Van Arsdale Fish Screen Facility Back-up Generator Building
Van Arsdale Fish Screen Facility Motor Control Building
Van Arsdale Fish Return Channel
Storage Building
Fish Ladder and Associated Facilities
Cape Horn Dam Fish Ladder Inlet/Outlet
Cape Horn Dam Fish Ladder
Fish Attraction Facility
Cape Horn Dam Fish Ladder Rock Fall Fence
Cape Horn Dam Fish Ladder Intake/Outlet Debris Boom
Project Communication/Powerlines
Conduit No. 1, 72-in. Butterfly Valve House Communication Line
Cape Horn Dam Control Building Communication/Powerline
Fish Screen Facility Communication/Powerline
Tunnel No. 1 Slide Gate and Adit Communication/Powerline
Penstock Nos. 1 and 2, 60-in. Stop Valves Communication/Powerline
Helicopter Landing Sites
Potter Valley Powerhouse Helicopter Landing Site
Ancillary and Support Facilities
Potter Valley Powerhouse Operators Office
Potter Valley Powerhouse Maintenance Office
Potter Valley Powerhouse Operators Restrooms
Project Facility Access Roads
Cape Horn Dam East Access Rd
Intake Access Rd
Penstock, Pipeline and Butterfly Valve House Access Rd (access for private landowner)
Powerhouse Main Access Rd
Project Facility Access Trails
Gage E11 Access Trail
Recreation Facilities and Access Roads
Family Campground
Trout Creek Campground
• Trout Creek Campground Loop Rd
Group Campground
Trout Creek Group Campground
• Trout Creek Campground Rd

Table 2-3. Project facility specifications.

Scott Dam Area (elevations are based on PG&E Datum, which equals NGVD 29 + 81.7 ft.)	
Dam	
Scott Dam	
Dam Location	Eel River
Dam Type	Concrete, gravity
Dam Height and Length	130 ft. high and 805 ft. long
Spillway Crest Elevation	1,900 ft.
Spillway Type	Ogee
Spillway Gates[1]	• 5 radial gates each 32 ft. wide by 10 ft. high • 26 steel slide gates each 10 ft. high and varying width from 7.5 ft. to 10.08 ft.
Diversion/Outlet Tunnel	• Outlet type/capacity: 72-in.-diameter, riveted-steel pipe (invert elevation 1,812 ft.) • Controlled by a 42-in. Lauren-Johnson needle valve • Rated capacity: 400 cfs at reservoir elevation of 1,910 ft.
Reservoir	
Lake Pillsbury	
Normal Maximum Water Surface Area	2,275 acres
Normal Maximum Water Surface Elevation	1,910 ft.
Current Usable Storage Capacity	66,876 ac-ft
Cape Horn Dam Area (elevations are based on NGVD 29)	
Dam	
Cape Horn Dam	
Dam Location	Eel River
Dam Type	Earthfill and concrete, gravity
Dam Height and Length	Earthfill section: 60 ft. high and 237 ft. long Concrete, gravity section: 63 ft. high and 283 ft. long
Spillway Elevation	Earthfill section: 1,516.8 ft. Concrete, gravity section: 1,490.3 ft.
Spillway Type	Overflow
Spillway Gates	—
East and West Release Gates	Instream flow release

Cape Horn Dam Area (elevations are based on NGVD 29) (continued)	
Fish Ladder	• Pool-and-weir ladder, with submerged orifices in upper ladder bays • 10–12 cfs capacity • Ladder attraction flows of ~100 cfs provided by weir across Eel River below Cape Horn Dam
Reservoir	
Van Arsdale Reservoir	
Normal Maximum Water Surface Area	106 acres
Normal Maximum Water Surface Elevation	1,490.3 ft.
Current Usable Storage Capacity	390 ac-ft
Diversion System	
Van Arsdale Intake	
Fish Screens	• Pair of inclined plane screens • 600 sq. ft of screen area for each screen • Designed to pass 240 cfs each
Archimedes Screw Pump	• 84 in. by 44 ft., 6 in. • Flow rate is approximately 4 cfs • Passes fish from screens to fish return channel
Fish Return Channel	• 214 ft., 11 in. long; 4 ft. wide; 5 to 6 ft. deep • Passes fish from Archimedes screw pump to fish return pipe
Fish Return Pipe	• 18-in. diameter; 416 ft. long • Passes fish from fish return channel to fish ladder at Cape Horn Dam
Diversion Tunnel	72-in. diameter, 320 cfs capacity
Tunnel No. 1	
Overall Length	5,826 ft. long
Section No. 1	205-ft.-long, concrete-lined, modified, horseshoe-shaped section, 7 ft. high by 6 ft. wide
Section No. 2	5,453-ft.-long, timber-lined, trapezoidal-shaped section, 7.16 ft. high, with a bottom width of 6 ft. and a top width of 5 ft.
Section No. 3	129-ft.-long, concrete-lined, circular section, 7.25 ft. in diameter
Section No. 4	39-ft.-long, concrete and steel-lined section, 7.25 ft. in diameter
Control	6-ft. by 6.5-ft. slide gate is located between the horseshoe-shaped tunnel section and the timber-lined section

Cape Horn Dam Area (elevations are based on NGVD 29) (continued)	
Conduit No. 1	
Overall Length	457 ft. long
Section No. 1	A 50-ft.-long "day lighted" steel pipe section containing a 72-in. butterfly valve and a sand trap/settling chamber
Section No. 2	367-ft.-long, 7-ft.-diameter wood stave conduit
Section No. 3	29-ft.-long steel pipe, varying in diameter from 7 to 7.25 ft.
Section No. 4	10-ft.-long, 7.25 ft.-diameter steel pipe
Control	72-in. penstock butterfly valve
Tunnel No. 2	
Overall Length	807 ft. long
Section No. 1	78-ft.-long, 7.25 ft. in diameter concrete and steel-lined circular section
Section No. 2	729-ft. long, 7 to 7.25 ft. in diameter concrete-lined, circular section
Control	None
Conduit No. 2	
Overall Length	367 ft. long
Section No. 1	8.1-ft. steel pipe that tapers from 7.25 ft. to 7 ft. in diameter
Section No. 2	359-ft.-long, 7-ft.-diameter wood stave conduit
Control	Two 60-in.-diameter gate valves at the heads of Penstock No. 1 and No. 2
Powerhouse	
Penstock No. 1	
Length	1,793 ft. long
Type	Riveted-steel pipe
Diameter	Varying from 62 in. at the gate valve to 48 in. at the powerhouse
Penstock No. 2	
Length	1,812 ft. long
Type	Riveted-steel pipe
Diameter	Varying from 62 in. at the gate valve to 48 in. at the powerhouse

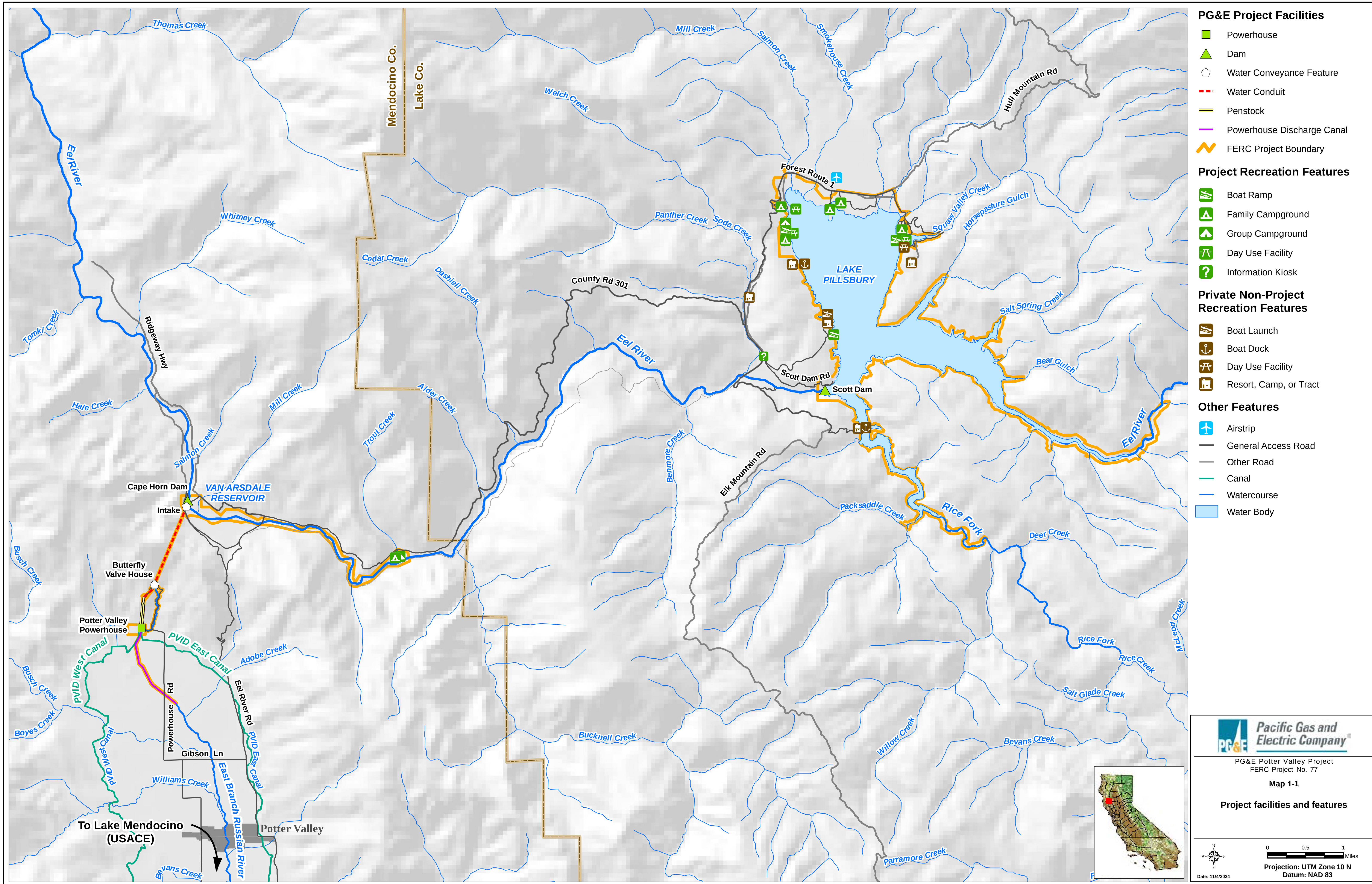
Cape Horn Dam AREA (elevations are based on NGVD 29) (continued)	
Unit 1	
First Date of Operation	2-9-1939
Installed Capacity, Generator	4,400 kW
Type of Turbine	Single horizontal reaction turbine
Horsepower	6,500
RPM	720
Minimum Hydraulic Capacity	45 cfs
Maximum Hydraulic Capacity	170 cfs
Unit 3	
First Date of Operation	3-1-1910
Installed Capacity, Generator	2,559 kW
Type of Turbine	Single horizontal reaction turbine
Horsepower	4,000
RPM	450
Minimum Hydraulic Capacity	25 cfs
Maximum Hydraulic Capacity	85 cfs
Unit 4	
First Date of Operation	9-15-1917
Installed Capacity, Generator	3,060 kW
Type of Turbine	Single horizontal reaction turbine
Horsepower	4,000
RPM	450
Minimum Hydraulic Capacity	25 cfs
Maximum Hydraulic Capacity	85 cfs
Overall Powerhouse	
Static Head[2]	475.5 ft.
Total Maximum Flow	331 cfs
Total Prime Mover Capacity	14,500 hp
Total Generator Capacity	10,019 kW
Peak Output	9,200 kW
First Date of Operation[3]	4-1-1908

Notes: ac-ft = acre-feet, cfs = cubic feet per second ft. = feet/foot, hp = horsepower, in. = inch(es), kW = kilowatts, RPM = revolutions per minute

[1] In 2023, PG&E discontinued closing the gates on Scott Dam in the spring due to seismic concerns.

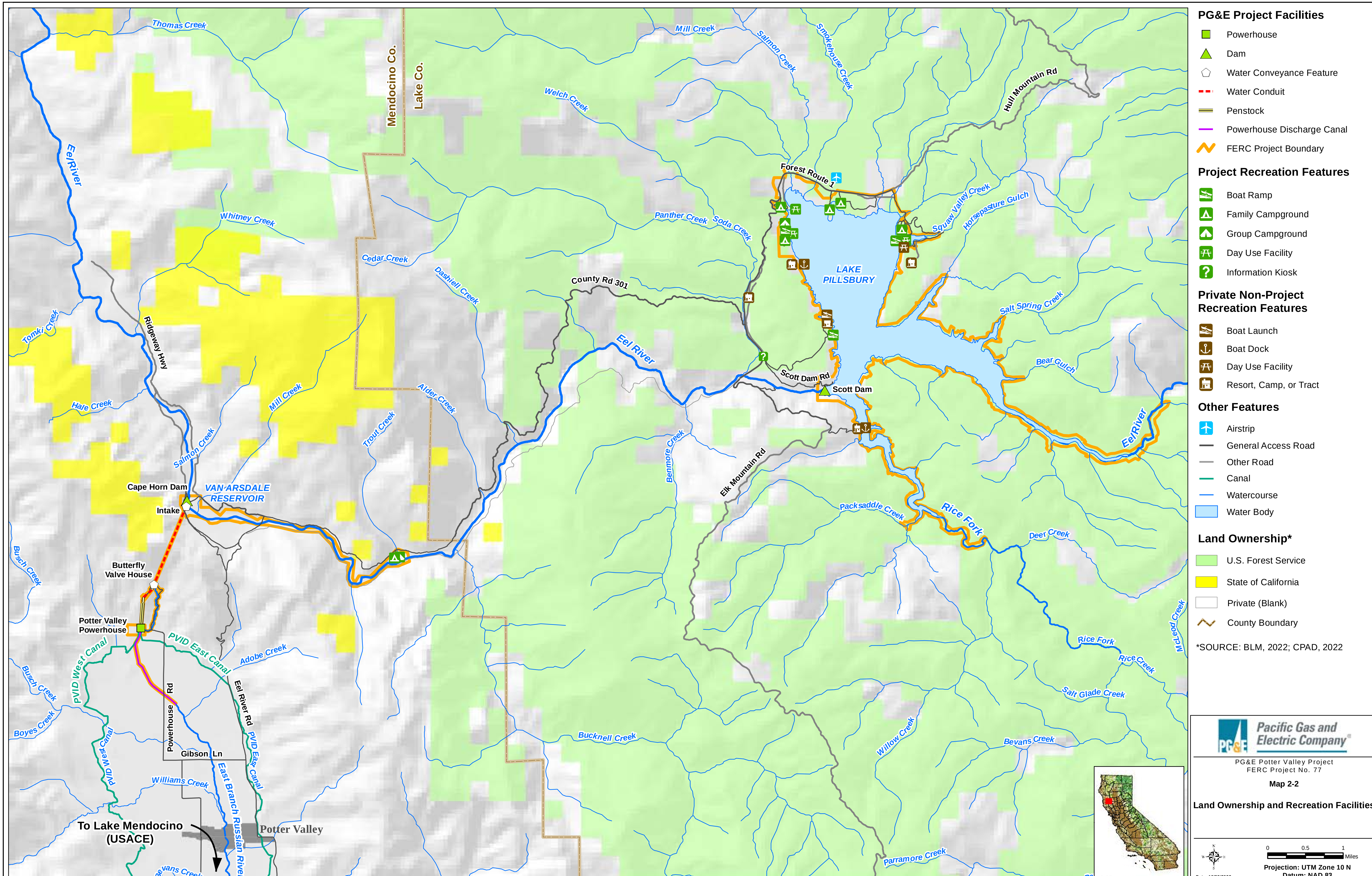
[2.] Water surface at Van Arsdale Reservoir at spill crest elevation 1,490.3 ft.

[2] Original Units Nos. 1 and 2 were replaced in 1939 as Unit No. 1.



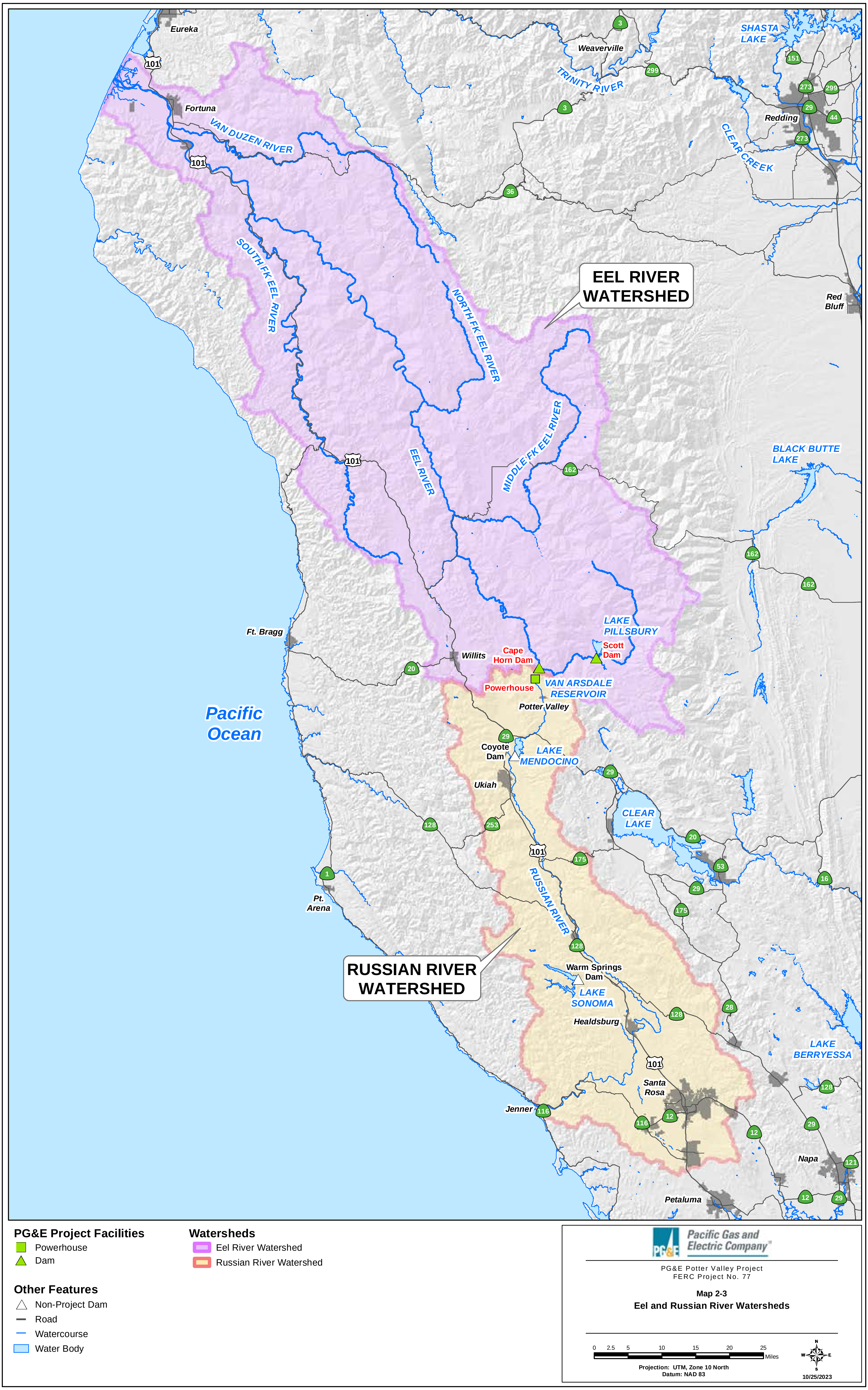
C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\CulturalMaps\Map 3.3.12-1 ProjectFacilities&Features_11i17i_10.mxd

This Page Intentionally Left Blank



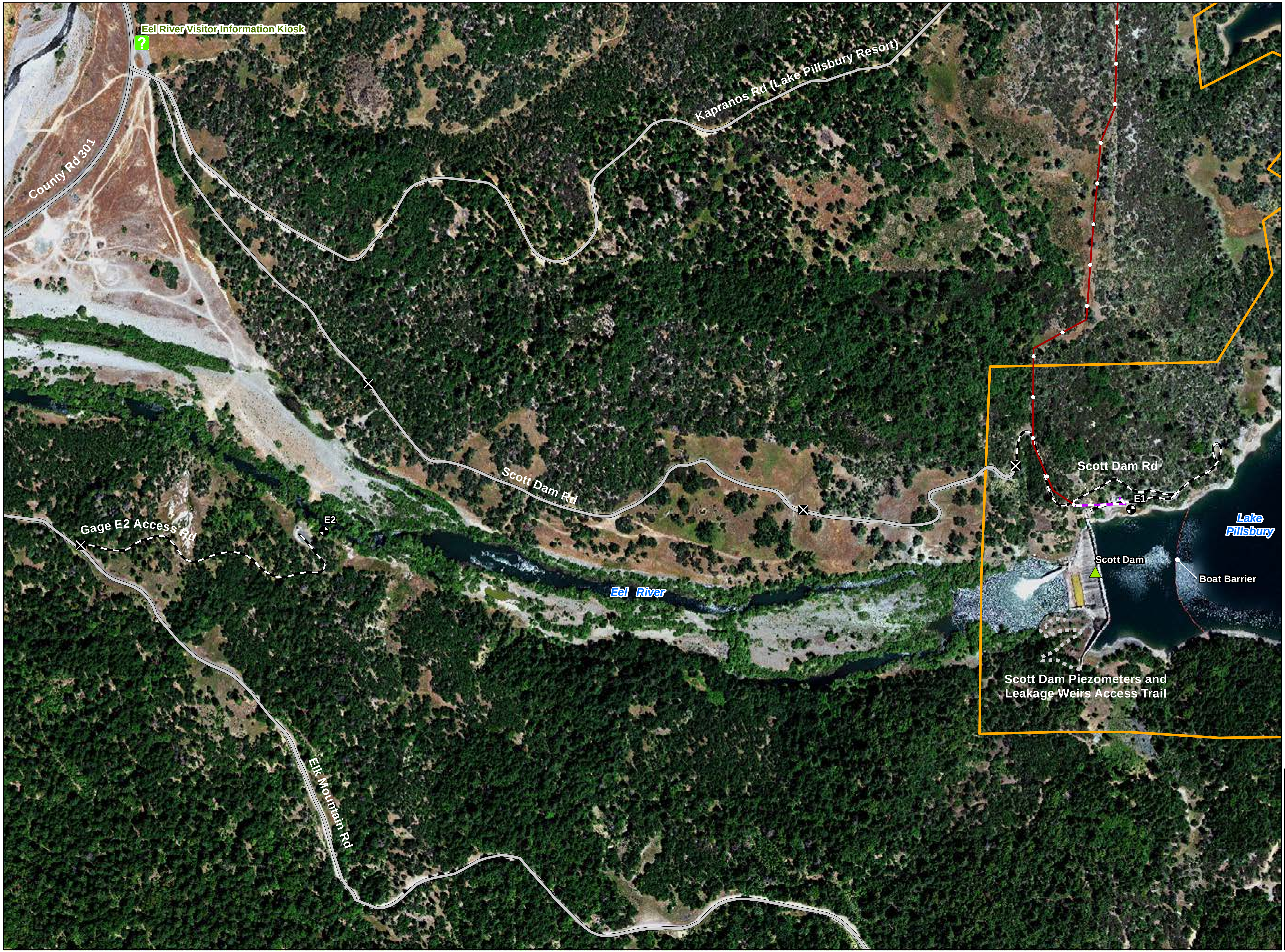
C:\GIS\185706343\03_data\gis_cad\map\PGE_PotterValley_Juris_17i11i_11.mxd

This Page Intentionally Left Blank



C:\GIS\185706343\03_data\gis_cad\map\PGE_PotterValley_Watersheds_11i17i_10.mxd

This Page Intentionally Left Blank



PG&E Project Facilities

- Dam
- Gage
- Communication Line
- FERC Project Boundary

Other Features

- Project Road
- Project Trail
- Non-Project General Access Road
- Distribution or Powerline (Non-project)
- Gate

Project Recreation Features

- Information Kiosk

Pacific Gas and Electric Company

PG&E Potter Valley Project
FERC Project No. 77

Map 2-4a

Scott Dam Area

0 250 500 Feet

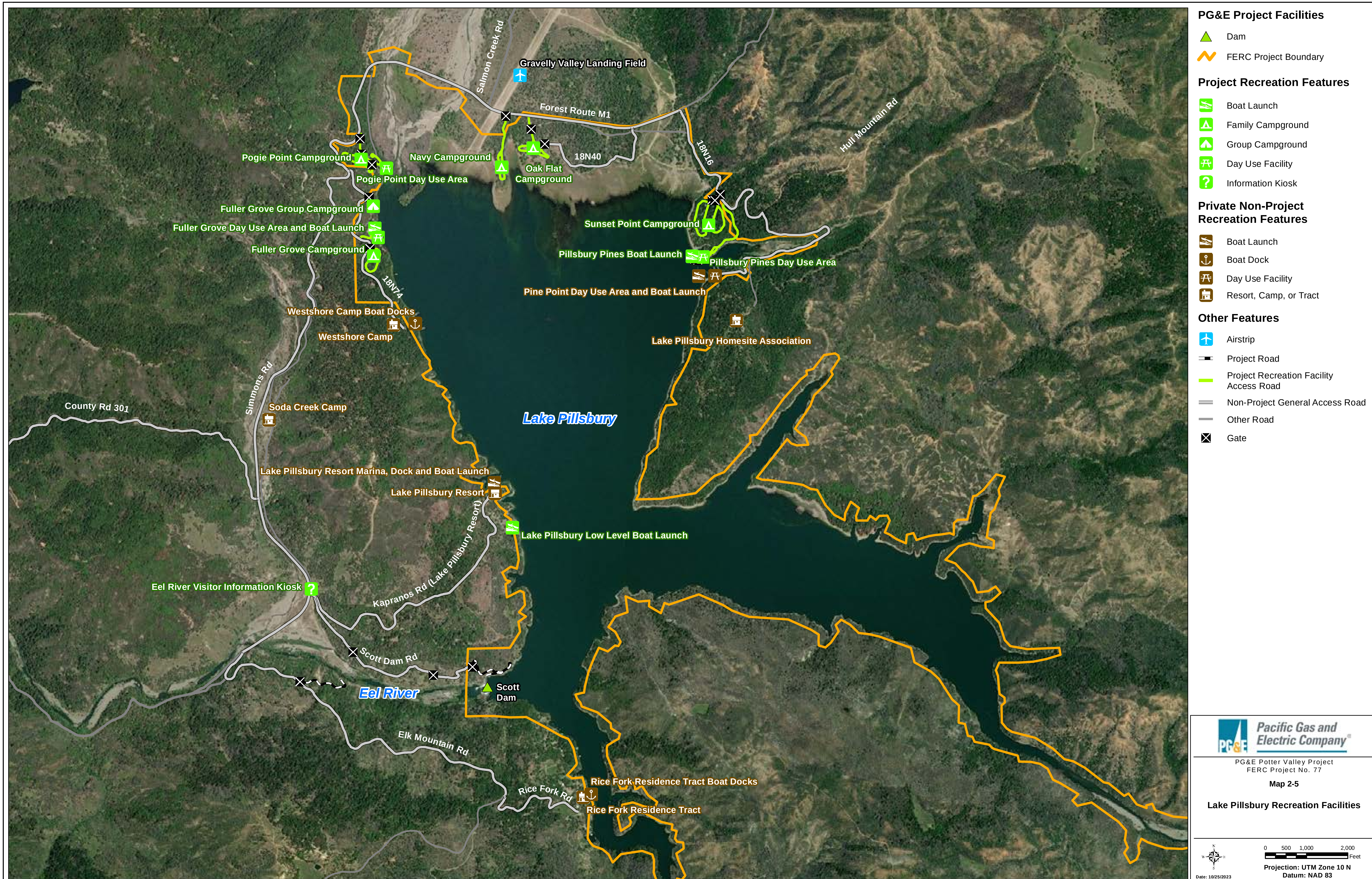
Projection: UTM Zone 10 N
Datum: NAD 83

Date: 10/26/2023

This Page Intentionally Left Blank

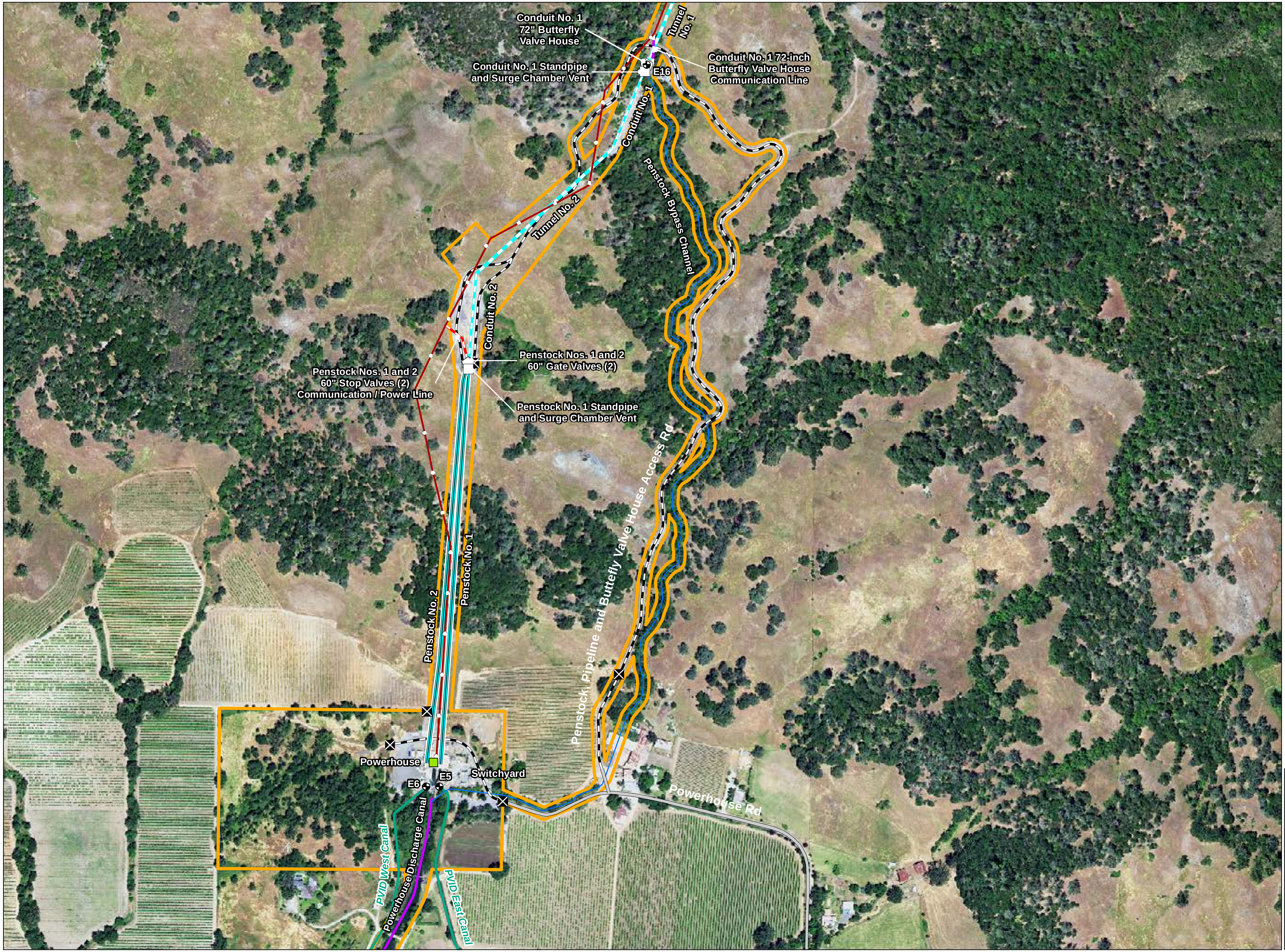
C:\GIS\185706343\03_data\gis_cad\map\FacilitiesMaps\PGE_PotterValley_ScottDam_11i17i_11.mxd

This Page Intentionally Left Blank



C:\GIS\185706343\03_data\gis_cad\map\RecreationMaps\PGE_PotterValley_Rec_LakePillsbury_11i17i_10.mxd

This Page Intentionally Left Blank



PG&E Project Facilities

- Powerhouse
- Water Conveyance Feature
- Ancillary and Other Facilities
- Water Conduit
- Penstock
- Powerhouse Discharge Canal
- Gage
- Communication / Power Line
- Communication Line
- FERC Project Boundary

Other Features

- Project Road
- Non-Project General Access Road
- Distribution or Powerline (Non-project)
- Gate
- Canal

Pacific Gas and Electric Company®

PG&E Potter Valley Project
FERC Project No. 77

Map 2-6a

Potter Valley Powerhouse, Penstock Bypass Channel and Powerhouse Discharge Canal

0 250 500 Feet

Date: 10/25/2023

Projection: UTM Zone 10 N
Datum: NAD 83

C:\GIS\185706343\03_data\gis_cad\map\FacilitiesMaps\PGE_PotterValley_PowerhouseArea_11i17i_11.mxd

This Page Intentionally Left Blank

PG&E Project Facilities

- Powerhouse
- Water Conveyance Feature
- Ancillary and Other Facilities
- Water Conduit
- Penstock
- Powerhouse Discharge Canal
- Gage
- Communication / Power Line
- Communication Line
- FERC Project Boundary

Other Features

- Project Road
- Non-Project General Access Road
- Distribution or Powerline (Non-project)
- Gate
- Canal

Pacific Gas and Electric Company

PG&E Potter Valley Project
FERC Project No. 77

Map 2-6b

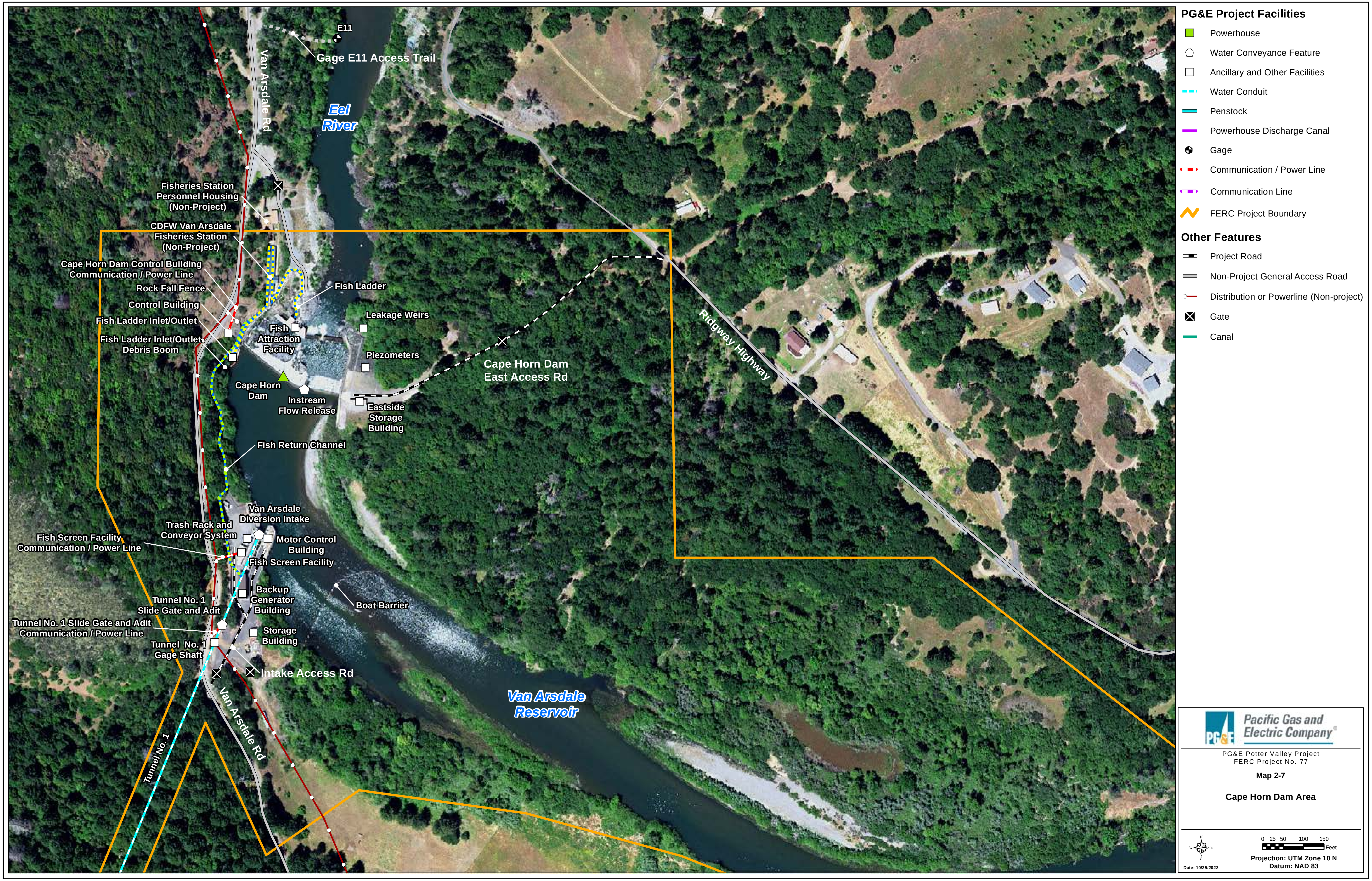
Potter Valley Powerhouse

0 25 50 100 Feet

Projection: UTM Zone 10 N
Datum: NAD 83

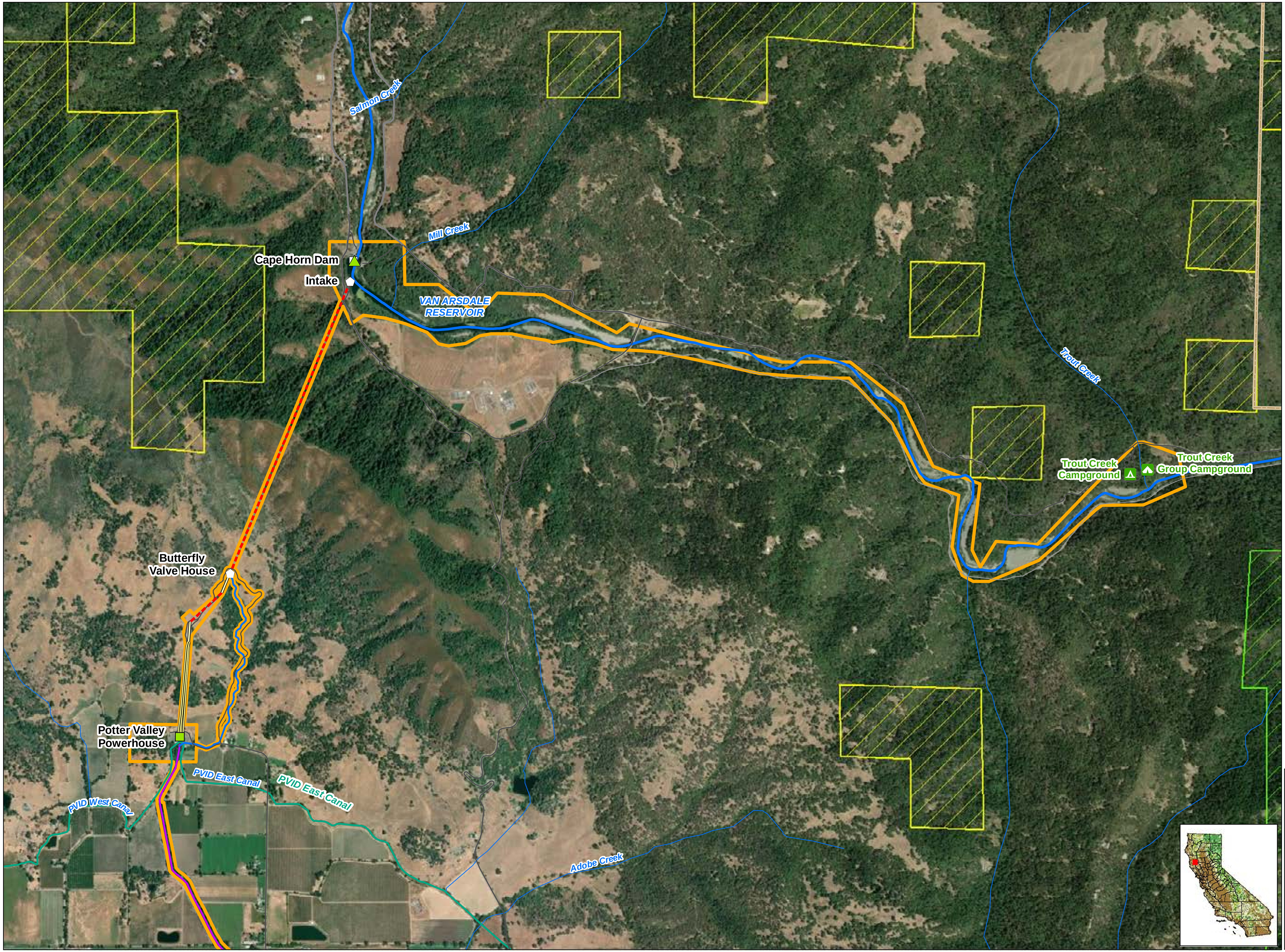
Date: 10/25/2023

This Page Intentionally Left Blank



C:\GIS\185706343\03_data\gis_cad\map\FacilitiesMaps\PGE_PotterValley_CapeHornDamArea_11i17i_11.mxd

This Page Intentionally Left Blank



PG&E Project Facilities

- Powerhouse
- Dam
- Water Conveyance Feature
- Water Conduit
- Penstock
- Powerhouse Discharge Canal
- FERC Project Boundary

Project Recreation Features

- Family Campground
- Group Campground

Other Features

- General Access Road
- Other Road
- Canal
- Watercourse

Land Ownership*

- U.S. Forest Service
- State of California
- Private (Blank)

*SOURCE: BLM, 2022; CPAD, 2022

Pacific Gas and Electric Company

PG&E Potter Valley Project
FERC Project No. 77

Map 2-7b

Van Arsdale Reservoir and recreation facilities.

0 500 1,000 1,500 2,000 Feet

Date: 12/17/2024

Projection: UTM Zone 10 N
Datum: NAD 83

This Page Intentionally Left Blank

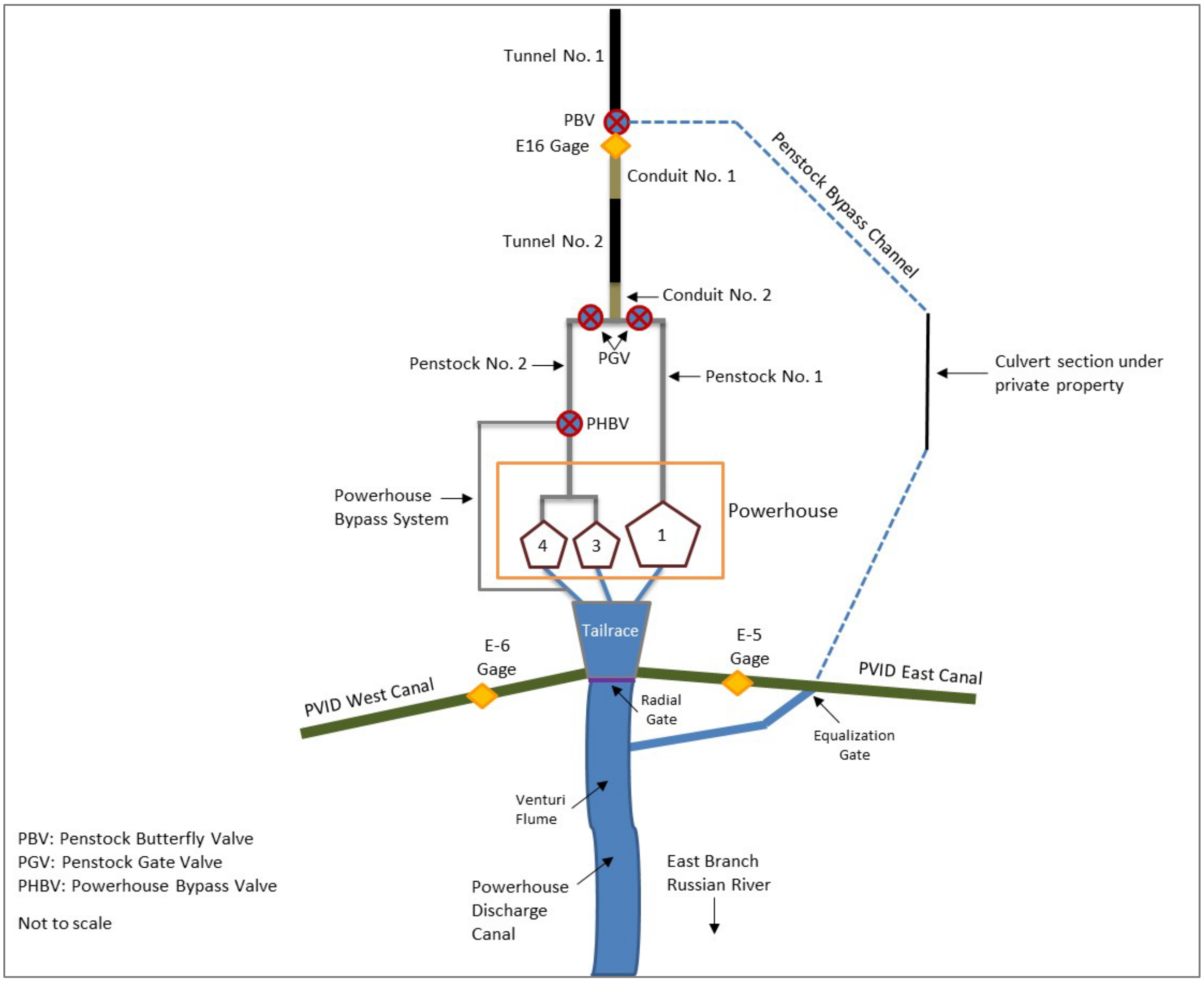


Figure 2-1. Potter Valley Powerhouse schematic.

2.1.1.1 Scott Dam Area

This section describes the Project facilities and features located in the Scott Dam Area. Note that Scott Dam Area elevations cited herein are based on PG&E's datum, which equals National Geodetic Vertical Datum of 1929 (NGVD29) + 81.7 feet.

Scott Dam

Scott Dam is a concrete, gravity-type, ogee-shaped structure having a maximum height of 130 feet (ft.) and a total length of 805 ft. The ogee crest (spill crest), which is at an elevation of 1,900 ft., is surmounted by five radial gates, each 32 ft. wide by 10 ft. high, and 26 steel slide gates, each 10 ft. high and varying in width from 7.5 ft. to 10.08 ft. The gates are manually operated with the exception of Gate 13, which is automated. Storage releases are made through a riveted-steel outlet pipe with a diameter of 72 inches (in.), which passes through the dam at invert elevation 1,812 ft. and is controlled by a 42-in. Lauren-Johnson needle valve. The needle valve is remotely operated.

Lake Pillsbury

Lake Pillsbury, formed by the construction of Scott Dam on the Eel River, has a surface area of approximately 2,275 acres at the normal maximum water surface elevation of 1,910 ft. and a current storage capacity of 68,871 acre-feet (ac-ft) (PG&E 2017). Due to concerns of bank instability in the reservoir and the potential for sloughing material to block the outlet needle valve or be released downstream creating high turbidity and streambed sedimentation, the reservoir is operated to maintain a minimum reservoir storage of at least 10,000 ac-ft, resulting in a normal usable storage of 58,871 ac-ft.

2.1.1.2 Cape Horn Dam Area

This section describes the Project facilities and features in the Cape Horn Dam Area. Note that all Cape Horn Dam Area elevations cited herein are based on National Geodetic Vertical Datum of 1988 (NAVD88).

Cape Horn Dam

Cape Horn Dam is 520 ft. long and consists of an earthfill section and a concrete, gravity overflow spillway section. The earthfill section on the right side of the dam is approximately 237 ft. long and has a 10-ft.-wide crest at elevation 1,516.8 ft. The maximum height of the embankment is roughly 60 ft. at the concrete retaining wall on the left side of the embankment. The embankment comprises earthfill with a concrete corewall.

The concrete, gravity overflow spillway section forms the left side of the dam and has a maximum height of 63 ft. The spillway crest is at elevation 1,490.3 ft. and is 283 ft. long.

There is a 5-ft.-diameter outlet through the spillway structure, which was abandoned in place in 1987 due to an accumulation of sediment preventing its operation and construction of a weir associated with fish ladder improvements that flooded the downstream side of the outlet. Currently, water passing downstream of the dam flows through the east and west release gates at the center of the dam, through the fish ladder on river left, or over the length of the spillway crest.

A pool-and-weir-type fish ladder provides fish passage over Cape Horn Dam, allowing fish access to the Eel River and its tributaries between Cape Horn and Scott dams. The fish ladder is 434 ft. long and rises a vertical distance of 40 ft. It consists of 49 pools, each measuring 8 ft. long, 4 to 10 ft. wide, and 3 to 4 ft. deep. The path of the ladder is roughly u-shaped, with the entrance located approximately 80 ft. downstream from the toe of the dam and the exit at the west end of the dam crest. The ladder passes through the Van Arsdale Fisheries Station. Downstream migrant fish screened at the Van Arsdale Intake, located approximately 400 ft. upstream of Cape Horn Dam, are introduced into the fish ladder just upstream of the counting station. A corrugated pipe along the ladder provides alternative upstream passage for adult lamprey.

Van Arsdale Reservoir

Van Arsdale Reservoir was formed by the construction of Cape Horn Dam on the Eel River. The reservoir has a surface area of approximately 65 acres at the normal maximum water surface elevation of 1,490.3 ft. (U.S. Geological Survey [USGS] datum). The original storage capacity of Van Arsdale Reservoir was more than 1,100 ac-ft when it was constructed in 1907. However, accumulation of sediment over time has resulted in significant loss of reservoir capacity. Based on the most recent bathymetric and topographic surveys, the current reservoir capacity is less than 390 ac-ft (McMillen Jacobs Associates 2021).

Van Arsdale Intake

Van Arsdale Intake diverts water upstream of Cape Horn Dam and conveys it to the Potter Valley Powerhouse, approximately 9,257 ft. to the south. The intake structure, located on the southwest bank of Van Arsdale Reservoir, is approximately 400 ft. upstream from Cape Horn Dam. At the entrance to the diversion tunnel, the intake consists of two fish screen bays, an inclined plane screen in each bay, an Archimedes screw pump, and a fish return channel.

The fish return channel leads to a secondary fish screen, which reduces the fish return flow from 4 cubic feet per second (cfs) to 2 cfs. This reduced flow carries screened fish and debris through a series of fish return pipes to a half-round ogee spillway and a baffled flume, where it discharges into the fish ladder just upstream of California Department of Fish and Wildlife's (CDFW's) Van Arsdale Fisheries Station.

Each of the inclined plane fish screens is approximately 82 ft. long and 8 ft. wide and consists of wedge wire screening material with 1/8-in. slotted openings. The screens are cleaned by an automated compressed air sparging system that blows debris off the screens from below. The debris is then carried by water flowing over the top of the screens to the fish bypass system. Each screen is designed to pass 240 cfs with an approach velocity of 0.4 ft. per second (i.e., 600 square feet of screen). However, the screens have been derated to 50 percent capacity due to current mechanical limitations, and so only 240 cfs total can be diverted through the screens.

Tunnels/Conduits

A trans-basin diversion system consisting of tunnels, steel pipes, and wood stave conduits passes through two ridges transporting water from the Van Arsdale Intake to Potter Valley Powerhouse. The first ridge is crossed by a 5,826-ft.-long underground tunnel (Tunnel No. 1). The second ridge is crossed by an 807-ft.-long underground tunnel (Tunnel No. 2). Tunnel No. 1 and Tunnel No. 2 are connected by an approximately 457-ft.-long aboveground conduit, which crosses the valley between the two ridges (Conduit No. 1). A second aboveground conduit section (Conduit No. 2), approximately 367 ft. in length, connects the downstream end of Tunnel No. 2 to Penstock No. 1 (1,793 ft. long) and Penstock No. 2 (1,812 ft. long).

Tunnel No. 1

Tunnel No. 1 is 5,826 ft. long and consists of the following sections:

- A 205-ft.-long, concrete-lined, modified, horseshoe-shaped section, 7 ft. high by 6 ft. wide;
- A 5,453-ft.-long, timber-lined, trapezoidal-shaped section, 7.16 ft. high, with a bottom width of 6 ft. and a top width of 5 ft.;
- A 129-ft.-long, concrete-lined, circular section, 7.25 ft. in diameter;
- A 39-ft.-long, concrete and steel-lined section, 7.25 ft. in diameter; and
- A 6-ft. by 6.5-ft. slide gate located between the horseshoe-shaped tunnel section and the timber-lined section.

Conduit No. 1

Conduit No. 1 is a 457-ft.-long section of conduit and valve, which connects Tunnel No. 1 to Tunnel No. 2 and consists of the following sections:

- A 50-ft.-long "day lighted" steel pipe section containing a 72-in. butterfly valve and a sandtrap/settling chamber;
- A 367-ft.-long, 7-ft.-diameter wood stave conduit;
- A 29-ft.-long steel pipe, varying in diameter from 7 ft. to 7.25 ft.; and
- A 10-ft.-long, 7.25-ft.-diameter steel pipe.

Tunnel No. 2

Tunnel No. 2 is 807- ft. long and consists of the following sections:

- A 78-ft.-long, 7.25 ft.-diameter concrete and steel-lined circular section; and
- A 729-ft. long, 7- to 7.25-ft.-diameter concrete-lined, circular section.

Conduit No. 2

Conduit No. 2 is 367 ft. long and connects the downstream end of Tunnel No. 2 to the penstocks. Conduit No. 2 consists of the following sections:

- An 8.1-ft. steel pipe that tapers from 7.25 ft. to 7 ft. in diameter; and
- A 359-ft.-long, 7-ft.-diameter wood stave conduit.

The wood stave portion of Conduit No. 2 bifurcates into two 62-in.-diameter pipes that lead to two 60-in.-diameter gate valves at the heads of Penstock No. 1 and No. 2.

Penstocks and Penstock Bypass

Penstock No. 1

Penstock No. 1 is a 1,793-ft.-long, riveted-steel pipe varying in diameter from 62 in. at the gate valve to 48 in. at the Potter Valley Powerhouse. Penstock No. 1 supplies water to Unit No. 1.

Penstock No. 2

Penstock No. 2 is a 1,812-ft.-long, riveted-steel pipe varying in diameter from 62 in. at the gate valve to 48 in. at the Potter Valley Powerhouse. A 30-in.-diameter wye branch from Penstock No. 2 supplies water to Unit No. 3 and Unit No. 4.

Penstock Bypass Channel and Powerhouse Bypass System

A butterfly valve house is located at the junction of Tunnel No. 1 and Conduit No. 1. Beginning near the butterfly valve house and terminating in the discharge canal downstream of the powerhouse, a seasonal creek is used as a penstock bypass channel to maintain flows in the East Branch Russian River during powerhouse outages that include dewatering of the entire penstock system. The capacity of the penstock bypass channel is approximately 25 cfs.

PG&E constructed a powerhouse bypass system in November 2009 with a capacity of 140 cfs. This is a fully automated system that is used to maintain required flow releases through the powerhouse as measured at gage E16. The powerhouse bypass system can only be used when the penstock is in service (the limited-capacity penstock bypass channel is still used when the penstock is taken out of service).

Powerhouse, Switchyard, and Tailrace

Potter Valley Powerhouse

The 9.2-megawatt Potter Valley Powerhouse has three generating units. Generation at the Potter Valley Powerhouse was discontinued in 2021. Water surface at Van Arsdale Reservoir at spill crest elevation (1,490.3 ft.), yields a static powerhouse head equal to 475.5 ft. The powerhouse is a steel-frame structure approximately 101 ft. long by 53 ft. wide.

The three generating units are Francis turbines (PG&E 1994) and are further described below.

- Unit No. 1[1] is a 6,500-horsepower, single horizontal reaction turbine operating at 720 revolutions per minute (RPM) that is directly connected to a 4,400-kilowatt (kW) generator rated at 5,500 kilovolt-amperes (kVA);
- Unit 3 is a 4,000-horsepower, single horizontal reaction turbine operating at 450 RPM that is directly connected to a 2,559-kW generator rated at 3,187 kVA; and
- Unit 4 is a 4,000-horsepower, single horizontal reaction turbine operating at 450 RPM that is directly connected to a 3,060-kW generator rated at 3,400 kVA.

[1] Original Units Nos. 1 and 2 were replaced in 1939 as Unit No. 1.

Potter Valley Powerhouse Switchyard

The Potter Valley Powerhouse Switchyard, located adjacent to the powerhouse, contains a main transformer bank with a total capacity of 12,000 kVA and steps up the powerhouse output from 2.4 kilovolts (kV) to 60 kV. The bank consists of four 4,000-kVA, single-phase, 60-cycle, air-cooled, outdoor-type transformers with one used as a spare. One station service transformer bank provides station light and power to the powerhouse. Three transformer banks (one is a back-up) and related facilities associated with PG&E's 12-kV distribution system are non-Project.[1]

Three 60-kV SF_6 gas circuit breakers provide direct connection into PG&E's transmission system at the powerhouse. Disconnect and bypass switches provide maintenance of the SF_6 gas circuit breakers.

Potter Valley Powerhouse Tailrace

The three generating units discharge water into the Potter Valley Powerhouse Tailrace. The tailrace comprises three individual concrete channels that join together into a common channel approximately 60 ft. downstream from the powerhouse. This common channel continues another 25 ft. to the 12-ft. by 6-ft. tailrace radial gate and forms the headworks for the Potter Valley Irrigation District (PVID) East and West canals. Water not diverted to the PVID canals flows into a 60-ft.-long Venturi flume, which discharges into the 6,325-ft.-long Powerhouse Discharge Canal. Water from the Powerhouse Discharge Canal flows into the East Branch Russian River.

2.1.1.3 Powerlines and Communication Lines

There are six Project communication lines and powerlines. In general, these lines provide communication and power to Project valve houses, slide gates, ancillary facilities (control buildings), and Van Arsdale Fisheries Station facilities (see Tables 2-1 and 2-2).

2.1.1.4 Gages, Weirs, and Piezometers

PG&E currently maintains a network of gaging stations that include one gage that measures reservoir elevation at Lake Pillsbury, three gages that measure diversion flows, two calculated diversion gages, and two gages that measure river flows below Scott Dam and Cape Horn Dam. In addition, PG&E maintains leakage weirs and piezometers[2] at Cape Horn Dam and Scott Dam. Project gage names and purposes are summarized in Table 2-4.

1 Transmission lines are not part of the Project. Power is fed directly to PG&E's interconnected transmission system, which passes through the powerhouse switchyard.

2 Pipe set vertically in the ground that is perforated at the end and is used to monitor groundwater level.

Table 2-4. Project gages.

PG&E Name	USGS No.	USGS Name	Purpose
Scott Dam Area			
Reservoir Gage			
E1	11470000	Lk Pillsbury NR Potter Valley CA	Measures Lake Pillsbury reservoir elevation
River Gage			
E2	11470500	Eel R BL Scott Dam NR Potter Valley CA	Measures flow in the Eel River downstream of Scott Dam
Cape Horn Dam Area			
Diversion Gages			
E5	11471105	Potter Valley Irrig CN E5 NR Potter Valley CA	Measures diversion to the PVID East Canal
E6	11471106	Potter Valley Irrig CN E6 NR Potter Valley CA	Measures diversion to the PVID West Canal
E16	11471000	Potter Valley PH Intake near Potter Valley CA	Meter at the Penstock No. 1 butterfly valve house measures flows from the Eel River to the Potter Valley Powerhouse
Calculated Diversion Gages			
EC6	11471100	Potter Valley Irrig CN 5+6 NR Potter Valley CA	Calculates total deliveries to PVID (EC6 = E5 + E6)
E7	11471099	Potter Valley PH (TR only) NR Potter Valley CA	Calculates flows from the Potter Valley Powerhouse to the East Branch Russian River (E7 = E16 – [E5 + E6])
River Gage			
E11	11471500	Eel R Van Arsdale Dam NR Potter Valley CA	Measures flow in the Eel River downstream of Cape Horn Dam

Notes: PVID = Potter Valley Irrigation District
USGS = United States Geological Survey

2.1.1.5 Ancillary and Support Facilities

Project ancillary and support facilities consist of the operator's office, maintenance office, and restrooms at Potter Valley Powerhouse; storage and control buildings at Cape Horn Dam; Cape Horn Dam Fish Ladder rock fall fence and debris booms; Scott Dam block building (which houses the generator, office, and control room); and Lake Pillsbury boat barrier. Ancillary and support facilities in the Scott Dam and Cape Horn Dam areas are summarized in Tables 2-1 and 2-2, respectively.

2.1.1.6 Project Access Roads and Trails

Various roads and trails used almost exclusively by PG&E for routine operation and maintenance of the Project are referred to as Project roads and trails and are identified in Tables 2-1 and 2-5. These tables also identify Project roads and trails used to access Project recreation facilities. County and USFS roads open to the public with multiple uses are not designated as Project roads.

Table 2-5. Project roads and trails.

Project Roads and Trails	Approximate Length (ft.)
Scott Dam Area	
Project Facility Access Roads	
Scott Dam Rd	1,513
Upper Scott Dam Access Rd	416
Gage E2 Access Rd	1,474
Project Facility Access Trails	
Scott Dam Piezometers and Leakage Weirs Access Trail	601
Recreation Facility Access Roads	
Fuller Grove Campground Rd	1,656
Fuller Grove Day-Use Area and Boat Launch Access Rd	588
Fuller Grove Group Campground Access Rd	488
Navy Campground Access Rd (18N50)	887
Navy Campground Loop Rd	1,482
Oak Flat Campground Rd	1,577
Pillsbury Pines Day-Use Area and Boat Launch Access Rd	2,196
Pogie Point Campground and Day-Use Area Access Rd (18N75)	1,543
Pogie Point Campground Loop Rd	1,759
Sunset Point Campground East Loop Rd	1,727
Sunset Point Campground West Loop Rd	2,331
Trout Creek Campground Loop Rd	405
Trout Creek Campground Rd	1,419
Cape Horn Dam Area	
Cape Horn Dam East Access Rd	970
Intake Access Rd	496
Penstock, Pipeline, and Butterfly Valve House Access Rd	6,175
Powerhouse Main Access Rd	648
Project Facility Access Trails	
Gage E11 Access Trail	166

2.1.1.7 Project Recreation Facilities

A variety of developed Project recreation facilities are located in the immediate vicinity of the Project. A list of these Project recreation facilities is included in Table 2-1. The locations of these recreation facilities are shown on Map 2-1, Map 2-2, and Map 2-5. Developed Project recreation facilities include family campgrounds, group campgrounds, and day-use facilities that are open to the public.

Five family campgrounds and one group campground are located along the shoreline of Lake Pillsbury (Map 2-5). In addition, one campground with both family and group capacity is located along the Eel River upstream of Van Arsdale Reservoir (Map 2-1). Developed day-use facilities in the vicinity of Lake Pillsbury include a visitor information kiosk, three day-use areas, three boat launches, and associated parking and picnic areas.

A variety of non-Project private recreation facilities, including recreational resorts and private camps, and private residence tracts are also located around Lake Pillsbury and shown on Map 2-5. With the exception of Westshore Camp, all of the private recreation facilities in the vicinity of Lake Pillsbury are located on National Forest System Lands and therefore operated under long-term lease agreements with the USFS. The Westshore Camp is located on PG&E land and operated by the Westshore Campers Association under a long-term lease agreement with PG&E. The owners of the private recreation facilities around Lake Pillsbury maintain boat docks and/or launches along the shoreline. These boat docks and launches are located within the FERC Project boundary, on land owned by PG&E, and are therefore operated under long-term agreements with PG&E.

2.1.2 Existing Project Operation

The Project is operated in compliance with existing regulatory requirements, agreements, and water rights to generate power and deliver consumptive water to local water users. The following sections summarize the regulatory requirements and water rights associated with the Project.

2.1.3 Existing Environmental Measures

Project operations are regulated by requirements contained in (1) the existing 1983 FERC license (FERC 1983); (2) the 2004 license amendment (FERC 2004), which incorporated the terms of National Marine Fisheries Service’s Reasonable and Prudent Alternative (RPA) (National Marine Fisheries Service 2002); and (3) a 2007 operational “reinterpretation” of the terms of the 2002 RPA. The Project is further limited by PG&E’s existing water rights and water supply agreement with PVID.

2.1.3.1 Regulatory Requirements

The original license for the Project was issued effective April 15, 1922, and expired on April 14, 1972. From 1972 to 1983, the Project operated on annual licenses during the extended relicensing period. FERC issued a new license for the Project in 1983, which was amended in January 2004. The amended license expired on April 14, 2022. The Project is currently operating annual licenses issued by FERC.

Over the years, FERC has additionally issued a variety of administrative orders associated with the license, which have included, for example, approval of reports, plans, and design drawings; extension of time to complete various actions; and approval of temporary modifications to the flow regime. Table 2-6 provides a summary of the license articles. Refer to the License Order for a complete description of each license article.

Table 2-6. FERC license articles.

License Article	Summary of License Articles
Article 1	The Project is subject to the provisions, terms, and conditions of the license.
Article 2	No substantial changes may be made in the plans, maps, specifications, and statements in the exhibits until approved by FERC.
Article 3	The Project will be in substantial conformity with the approved exhibits.
Article 4	The Project is subject to inspection by FERC’s regional engineer.
Article 5	Requires the Licensee to acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for Project construction, maintenance, and operation.
Article 6	In the event the Project is taken over by the United States upon termination or transfer of the license, Licensee will be responsible for and will make good any defect of title to or of right of occupancy, which is necessary for Project maintenance and operation.
Article 7	The Commission will determine the actual original cost of the Project and any addition thereto.
Article 8	Requires the Licensee to install and monitor stream gages and gaging stations.
Article 9	Requires the Licensee to install additional capacity or make other changes as directed by FERC.
Article 10	Requires coordination of Project with other power systems in the interest of power and other beneficial public uses of the water.
Article 11	Whenever the Licensee is directly benefited by the construction work of another Licensee, on a storage reservoir or other headwater improvement, the Licensee will reimburse the owner of the headwater improvement.
Article 12	The United States retains and safeguards the right to use water in such amount as may be necessary for the purposes of navigation; and operations controlled for the protection of life, health, and property and in the interest of conservation and utilization for power purposes and other beneficial public uses.
Article 13	Requires the Licensee to permit reasonable use of reservoir or other Project properties as may be ordered by FERC in the interest of comprehensive development of the waterway.
Article 14	Requires the Licensee to avoid interference between Project transmission lines or other Project facilities and any other communication facilities installed before or after construction.
Article 15	Requires the Licensee to construct, maintain, and operate protective devices in the interest of fish and wildlife resources, as ordered by FERC, or as recommended by other Federal or State agency after an opportunity for a hearing.
Article 16	Requires the Licensee to permit the United States to use, free of cost, Project works or lands to construct fish and wildlife facilities.

License Article	Summary of License Articles
Article 17	Requires the Licensee to construct, maintain, and operate reasonable recreational facilities as directed by FERC, or as recommended by other Federal or State agency after an opportunity for a hearing.
Article 18	Requires the Licensee to allow the public free access, to a reasonable extent (safety considerations), to Project waters and adjacent Project lands owned by the Licensee.
Article 19	Requires the Licensee to take reasonable measures to prevent soil erosion on land adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution resulting from Project construction, operation, or maintenance.
Article 20	Requires the Licensee to clear and keep clear lands along open conduits, and all trees along the periphery of reservoirs that may die during Project operation will be removed.
Article 21	Requires the Licensee only conduct dredge and fill activities in association with work specifically authorized under the license; during maintenance of the Project; or after obtaining FERC approval.
Article 22	Requires the Licensee to convey to the United States, free of cost, lands and rights-of-way required to construct, complete, or improve navigation facilities in connection with the Project.
Article 23	Requires that operation of any navigation facilities constructed in connection with the Project are controlled by reasonable rules and regulations in the interest of navigation.
Article 24	Requires the Licensee provide power, free of cost, to the United States for the operation and maintenance of navigation facilities in the vicinity of the Project.
Article 25	Requires the Licensee construct, maintain, and operate lights and other signals for the protection of navigation.
Article 26	Requires payment by Licensee for timber cut, used, or destroyed in the construction and maintenance of the Project on lands of the United States.
Article 27	Requires the Licensee to prevent, control, and suppress fires on Project lands.
Article 28	Licensee may not object to or prevent use of water for fire suppression.
Article 29	Requires the Licensee to be liable for destruction of any structures or property of the United States during Project construction, maintenance, or operation.
Article 30	Requires Licensee to permit any agency of the United States, without charge, to construct or permit conduits, chutes, ditches, railroads, roads, trails, telephone and powerlines, and other means of transportation and communication not inconsistent with the Project license.
Article 31	Requires state or federal jurisdictional approval over the location and standards of roads and trails; and other uses of land, including quarries, borrow pits, and spoil disposal areas during construction and maintenance.
Article 32	Requires Licensee to minimize interference with transmission, telegraph, telephone, etc., wires during construction and maintenance activities.
Article 33	Requires Licensee to clear and maintain transmission rights-of-way.
Article 34	Requires Licensee to cooperate with the disposal by the United States of mineral and vegetative materials, under the Act of July 31, 1947.
Article 35	Requires Licensee to maintain and operate the Project in good faith and comply with terms of the license and, if not, FERC will consider the Licensee's intent to surrender and terminate the license.

License Article	Summary of License Articles
Article 36	Right of the Licensee to use or occupy waters or lands of the United States for the purpose of maintaining the Project will cease at the end of the license period, unless the Licensee obtains a new license, or an annual license is issued.
Article 37	Terms and conditions in the license will not be construed as impairing any terms and conditions of the Federal Power Act.
Article 38	Requires the Licensee maintain identified flow releases from the Project for the protection and maintenance of fishery resources in the Eel River and the East Branch Russian River. [deleted]
Article 39	Requires the Licensee to develop a study plan to determine the effects of the flow release schedule provided for in Article 38 on the salmonid fishery resources of the Upper Eel River and the East Branch Russian River. [deleted]
Article 40	Requires the Licensee file with FERC functional design drawings of the modifications to the existing upstream fish passage facility at Cape Horn Dam, including a construction schedule and cost estimate.
Article 41	Requires the Licensee conduct a study to determine measures needed at Scott Dam to provide a temperature regime downstream needed to facilitate the timely migration of juvenile salmonids from the Upper Eel River.
Article 42	Requires the Licensee, prior to implementation of any construction projects, to consult with the California State Historic Preservation Officer (SHPO) to develop and implement a study for the identification and protection of cultural resources that may be affected by operation and maintenance of the Project.
Article 43	Requires the Licensee to maintain Lake Pillsbury's surface elevation at the highest, most practicable level, commensurate with other Project purposes during the summer recreation season. [deleted]
Article 44	Requires Licensee to file amended Exhibit K and Exhibit R-2 drawings for FERC approval.
Article 45	Requires Licensee to submit stability analysis of the Scott Dam under seismic loading to FERC.
Article 46	Requires Licensee to continue to consult and cooperate with appropriate Federal, state, and other natural resources agencies for the protection and development of the environmental resources and values of the Project area.
Article 47	Specifies annual charges that the Licensee will pay to the United States.
Article 48	Gives the Licensee authority to grant permission for certain types of use and occupancy of Project lands and waters without FERC approval as long as the use is consistent with protecting and enhancing scenic, recreational, and other environmental values of the Project.
Article 49	Specifies terms and conditions of amortization funds.
Article 50	FERC may modify or terminate this license in any manner considered appropriate in light of the final disposition of any litigation involving the water and related contractual rights with are incident in this Project.
Article 51	Requires the Licensee to file for FERC approval a plan to upgrade the Tomki Creek gage. [deleted]
Article 52	Requires the Licensee to file for FERC approval a plan to implement and comply with NOAA Fisheries' Reasonable and Prudent Alternative, and Reasonable and Prudent Measures of the Biological Opinion filed by NOAA Fisheries on November 29, 2002.

License Article	Summary of License Articles
Article 53	Requires the Licensee to file for FERC approval a plan for (1) funding of annual Chinook salmon carcass surveys; and (2) funding of the California Department of Fish and Game's Chinook salmon and stock rescue program.
Article 54	Requires the Licensee to file for FERC approval a plan to conduct or fund annual surveys to identify and monitor nesting, perching, and foraging areas used by bald eagles in the Lake Pillsbury area.
Article 55	Requires the Licensee to file for FERC approval a plan to conduct or fund bathymetric surveys of Lake Pillsbury every 10 years, beginning in 2005.
Article 56	Requires the Licensee extend a public boat ramp if water levels at both the Fuller Grove and Pillsbury Pines boat ramps are too low to permit the use of either ramp on three out of any 10 consecutive Labor Day holiday weekends following implementation of the flow schedule required by Article 51.
Article 57	Requires the Licensee install a continuous reading thermograph below Scott Dam during the months of August through October for a period of 10 years beginning in 2004.
Article 58	FERC reserves authority to require modifications to the Project license as may be necessitated by modification by the California State Water Resources Control Board of its Decision 1610.

Notes: Articles 1 to 37 are described in FERC's Form L-5, Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters and Lands of the United States (FERC 1975). Articles 38, 39, and 43 were removed from the Project license on January 28, 2004 (106 FERC 61,065).

2.1.3.2 Water Rights

PG&E holds water rights for both power and consumptive uses. Water was diverted from the Eel River for generation at Potter Valley Powerhouse in the East Branch Russian River Watershed; generation at the powerhouse was discontinued in 2021. After passing through the Potter Valley Powerhouse, a portion of the powerhouse outflow is diverted via canals to PVID for consumptive use. The remaining outflow is abandoned to the East Branch Russian River. This abandoned water adds significant inflow to Lake Mendocino and benefits downstream users.

PG&E has three licensed water rights for Project diversions and two pre-1914 water rights (Table 2-7). License 1424, with a priority date of March 12, 1920, allows PG&E to divert and store up to 102,366 ac-ft per annum (afa) at Lake Pillsbury for the beneficial uses of hydropower generation and incidental Fish and Wildlife Protection and Enhancement. License 1199, with a priority date of August 15, 1927, allows PG&E to divert and store up to 4,500 afa at Lake Pillsbury for irrigation purposes within the PVID service area. License 5545, with a priority date of March 11, 1930, allows PG&E to divert to storage up to 4,908 afa of water at Lake Pillsbury and to directly divert up to 40 cfs from the Eel River for irrigation purposes within the PVID service area in the Russian River Watershed.

PG&E claims a pre-1914 water right to directly divert up to 340 cfs from the Eel River, as specified in Statement of Water Diversion and Use (SWDU) 1010, for power generation and irrigation use. PG&E also claims a pre-1914 water right to store up to 1,457 afa in Van Arsdale Reservoir, as specified in SWDU 4704, for power, irrigation, and domestic use.

Table 2-7. Summary of existing water rights.

Appl. No.	License/ Permit No.	SWDU No.	Priority / First Use	Gage	Storage (afa)	Direct Diversion (cfs)	Season Begin	Season End	Description (Name of Works)	Point of Diversion	Place of Use	Type of Use	Water Right Class
1719	1424	–	3/12/1920	E 1	102,366	–	Nov 1	Jun 1	Lake Pillsbury (Scott Dam)	Eel River	Potter Valley Powerhouse	P, FWL	License
5661	1199	–	8/15/1927	E 1	4,500	–	Nov 1	Apr 30	Lake Pillsbury (Scott Dam)	Eel River	PVID	I	License
6594	5545	–	3/11/1930	E 1	4,908	–	Nov 1	Jun 1	Scott Dam	Eel River	PVID	I	License
				E C6	–	40	May 1	Oct 31	Cape Horn Dam				
–	–	1010	1905	E 16	–	340	–	–	Potter Valley Powerhouse Diversion	Eel River	Potter Valley Powerhouse	P, I	Pre-1914
–	–	4704	1907	E 3	1,457	–	–	–	Van Arsdale	Eel River	Potter Valley Powerhouse and PVID	P, I, D	Pre-1914

Notes:
afa = acre-feet per annum
cfs = cubic feet per second
D = domestic
FWL = fish and wildlife
I = irrigation
P = power
PVID = Potter Valley Irrigation District
SWDU = Statement of Water Diversion and Use

2.2 Applicant's Proposal

As described in Section 1.0, PG&E's proposal consists of an Application for Surrender of License and an Application for Non-Project Use of Project Lands. This section describes the Proposed Action analyzed under each application.

The Proposed Action under the Application for Surrender of License (Proposed Action) includes:

- Decommissioning and removal of Scott Dam and associated facilities and features;
- Removal and restoration of certain Project recreational facilities (e.g., campgrounds, day-use facilities, recreation access roads and trails, kiosk, and boat ramps) located on USFS and PG&E lands;
- Decommissioning and removal of Cape Horn Dam and associated facilities and features except for limited components that will be needed for the NERF;
- Removal of NERF facilities and lands from the existing FERC license; and
- Restoration of the remnant inundation zone of Lake Pillsbury and Van Arsdale Reservoir.

The Proposed Action under the Application for Non-Project Use of Project Lands (NPUPL Proposed Action) includes:

- Authorization for construction of the new NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River, a conduit from the pump station to the tunnel inlet, retaining wall and fill behind the retaining wall, and modification of the Potter Valley Powerhouse.

2.2.1 Surrender of License

The Application for Surrender of License consists of a Conceptual Decommissioning Plan, which represents PG&E's recommendations for decommissioning of Project facilities such that the Project will be removed from FERC and DSOD jurisdiction and will eliminate PG&E's generation capabilities. The Conceptual Decommissioning Plan includes the following:

- A concept-level description of decommissioning of Project facilities/features and Project recreation facilities at the Scott Dam Area and at the Cape Horn Dam Area;
- A list of facilities that must be removed from the FERC license and transferred to the Eel-Russian Project Authority (ERPA) to allow for development of the NERF;
- A concept-level description of restoration activities to be implemented at Project dams and lake/reservoir and Project recreation facilities following completion of construction activities;
- A schedule for the proposed decommissioning and restoration activities; and
- A list of permits and other regulatory approvals required for implementation of the Conceptual Decommissioning Plan.

2.2.1.1 Conceptual Decommissioning Plan

The Conceptual Decommissioning Plan represents PG&E's recommendations for decommissioning of Project facilities such that the Project is removed from FERC and DSOD jurisdiction and PG&E's generation capabilities are eliminated. PG&E is currently conducting the engineering analysis necessary for the development of detailed decommissioning plans for the removal of Scott Dam, Cape Horn Dam, and Project recreation facilities. Following submittal of the Final Surrender Application and FERC's issuance of the Surrender Order, PG&E will provide detailed engineering plans for FERC review and approval.

Decommissioning of Project Facilities and Features

This section of the Conceptual Decommissioning Plan is organized into two geographic areas—Scott Dam Area and Cape Horn Dam Area. PG&E's approach to removal of the dams and the associated lake/reservoir and the decommissioning of associated Project facilities/features and Project recreation facilities is summarized for each area. Due to the complexity of construction activities, a more detailed description is provided for the removal and modification of Project dams.

Refer to Tables 2-1 and 2-3 for a summary of the decommissioning of Project facilities and features and Project recreation facilities in the Scott Dam and Cape Horn Dam areas and the associated land jurisdiction.

Scott Dam Area

The following provides a description of decommissioning of Scott Dam and associated Project facilities and features and Project recreation facilities. Table 2-8 provides a summary of decommissioning of Project facilities and features and Project recreation facilities in the Scott Dam Area and the associated existing land ownership. Decommissioning of Project facilities and features and Project recreation facilities includes leaving the facility in place (L), removal of the facility with restoration (RR), removal of the facility with no restoration (X), and transfer of Project facilities necessary for the NERF to ERPA and removal from the FERC license (T).

Table 2-8. Decommissioning of Project facilities and features and Project recreation facilities in the Scott Dam Area.

Project Facility/Feature or Project Recreation Facility	Land Ownership	Decommissioning
Dam and Associated Facility/Features		
Scott Dam	PG&E	RR
Valve Control House	PG&E	X
Reservoir		
Lake Pillsbury (storage reservoir)	PG&E/USFS	RR
Reservoir Gage		
E1—Lk Pillsbury NR Potter Valley CA (11470000)	PG&E	X

Project Facility/Feature or Project Recreation Facility	Land Ownership	Decommissioning
River Gages		
E2—Eel R BL Scott Dam NR Potter Valley CA (11470500)	PG&E	T
Leakage Weirs and Piezometers and Associated Trail		
Scott Dam Leakage Weirs	PG&E	RR
Scott Dam Piezometers	PG&E	L (cap)
Scott Dam Piezometers and Leakage Weir Access Trail	PG&E	L
Project Communication Line		
Scott Dam Block Building Communication Line	PG&E	X
Ancillary and Support Facilities		
Scott Dam Block Building	PG&E	L (remove equipment only)
Scott Dam Boat Barrier	PG&E	X
Project Facility Access Roads		
Gage E2 Access Rd	PG&E	T
Scott Dam Rd	PG&E	L
Upper Scott Dam Access Rd	PG&E	L
Project Recreation Facilities and Access Roads		
Family Campgrounds		
Fuller Grove Campground	USFS	RR
Fuller Grove Campground Rd	USFS	RR
Navy Campground	USFS	RR
Navy Campground Access Rd (18N50)	USFS	RR
Navy Campground Loop Rd	USFS	RR
Oak Flat Campground	USFS	RR
Oak Flat Campground Rd	USFS	RR
Pogie Point Campground	USFS	RR
Pogie Point Campground Loop Rd	USFS	RR
Pogie Point Campground and Day-Use Area Access Rd (18N75)	USFS	RR
Sunset Point Campground	USFS	RR
Sunset Point Campground East Loop Rd	USFS	RR
Sunset Point Campground West Loop Rd	USFS	RR

Project Facility/Feature or Project Recreation Facility	Land Ownership	Decommissioning
Group Campgrounds		
Fuller Grove Group Campground	PG&E	RR
Fuller Grove Group Campground Access Rd	PG&E	RR
Day-Use Facilities		
Eel River Visitor Information Kiosk	USFS	RR
Fuller Grove Day-Use Area and Boat Launch	PG&E	RR
Fuller Grove Day-Use Area and Boat Launch Access Rd	PG&E	RR
Pillsbury Pines Day-Use Area and Boat Launch	PG&E	RR
Pillsbury Pines Day-Use Area and Boat Launch Access Rd	USFS/PG&E	RR
Pogie Point Day-Use Area	USFS/PG&E	RR
Lake Pillsbury Low Level Boat Launch	USFS/PG&E	RR

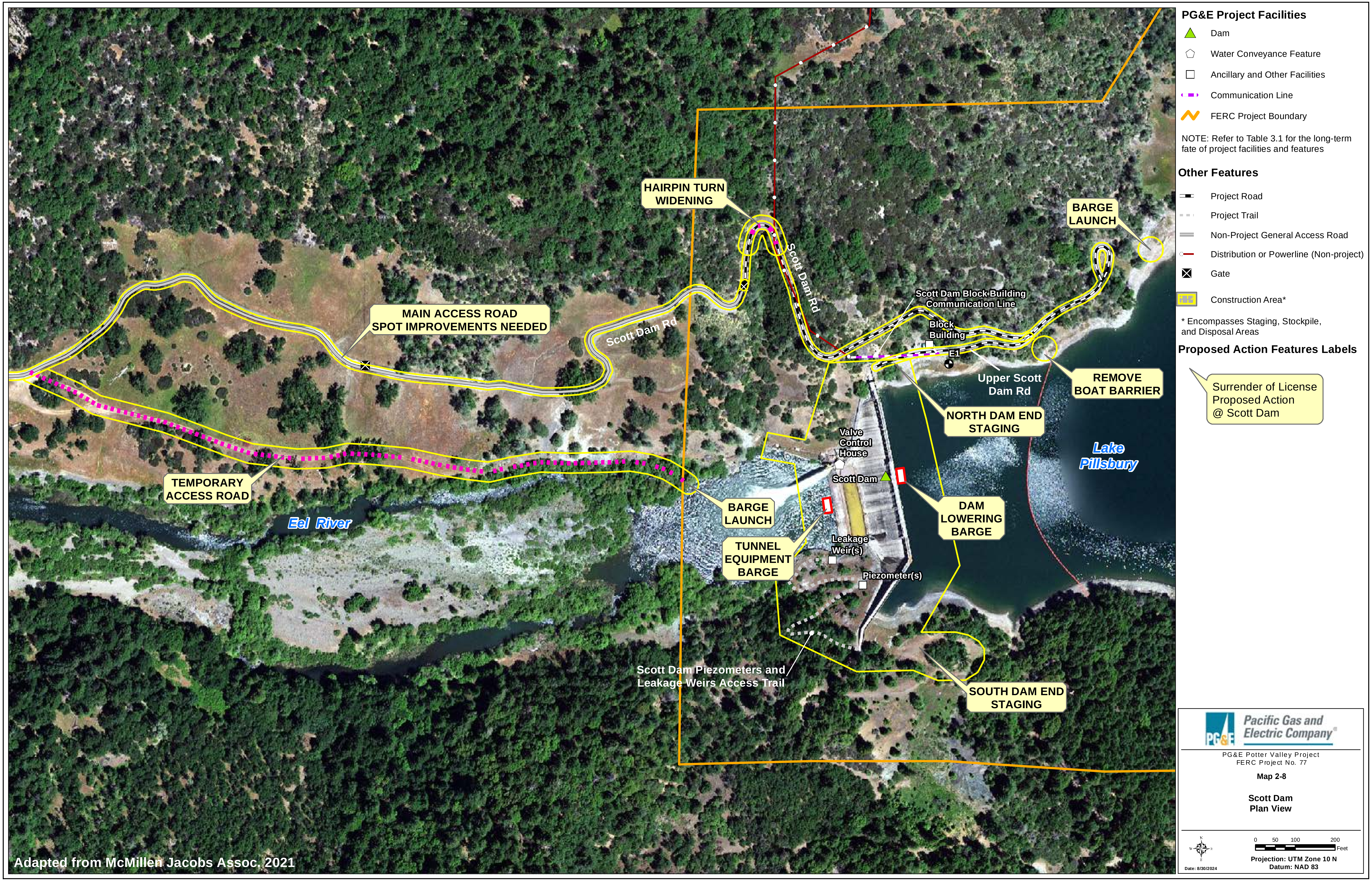
Scott Dam and Associated Project Facility/Feature Removal

PG&E will implement the Rapid Dam Removal approach to decommission Scott Dam. The description of Rapid Dam Removal is based on the *Scott Dam and Cape Horn Dam Removal Alternatives Technical Memorandum* (McMillen Jacobs Associates 2021), existing site conditions, and technical expertise. Scott Dam Area elevations cited herein are based on PG&E's datum, which equals NGVD29 + 81.7 ft.

Rapid Dam Removal entails expedited removal of Scott Dam (approximately 2 years in duration depending on site conditions and flows) such that no water is impounded and volitional fish passage and unimpaired flows occur. The structure would no longer be under the jurisdiction of FERC or DSOD. Rapid Dam Removal would result in the flushing of a large volume of sediment (approximately 12 million cubic yards [cy]) downstream of the remnant reservoir into the Eel River. See Map 2-8 and Figures 2-2 and 2-3 for plan and section views of the dam removal. Provided below is a description of the construction area and rapid removal of Scott Dam and associated Project facilities/features.

Construction Area

The construction area for Scott Dam removal and associated facilities/features includes all areas necessary for construction, including the construction work area, site access improvements, staging areas, and stockpile areas. Map 2-8 shows the Scott Dam construction area. Staging and stockpile areas necessary for removal of the dam and decommissioning of facilities and features will be established on currently developed and disturbed areas within the construction area.



C:\GIS\185706343\03_datalgis_cad\map\FacilitiesMaps\DecomMaps\PGE_PotterValley_SD_Removal_11i17i_11.mxd

This Page Intentionally Left Blank

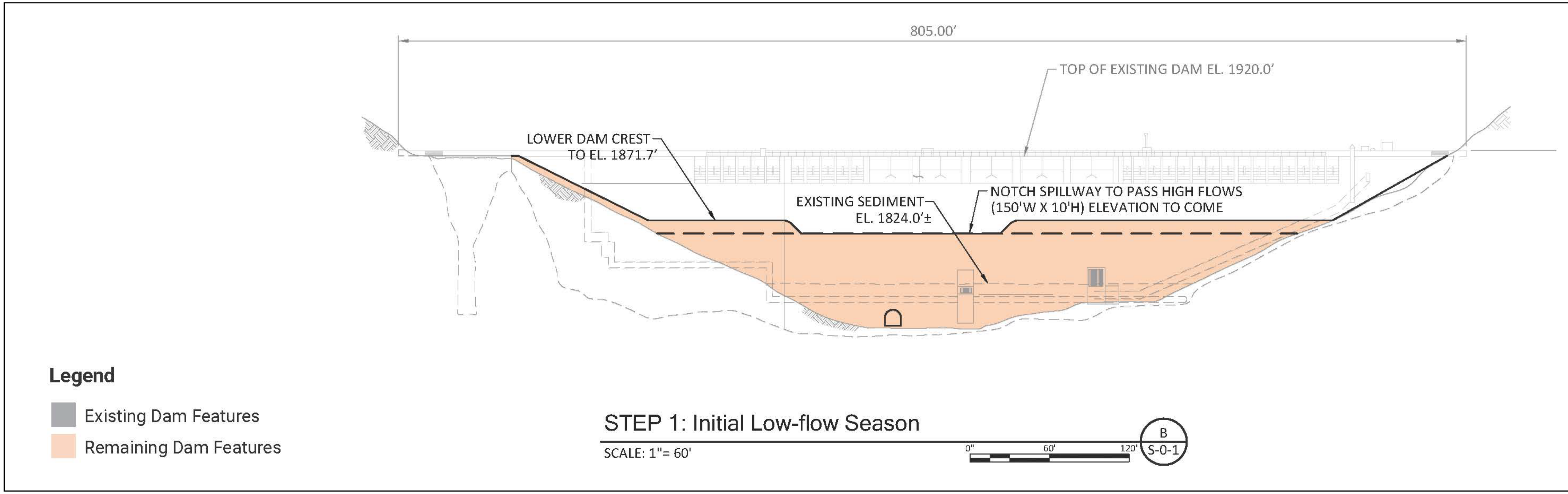


Figure 2-2. Scott Dam removal—initial dam removal cross section (cross section—initial low-flow season).

This Page Intentionally Left Blank

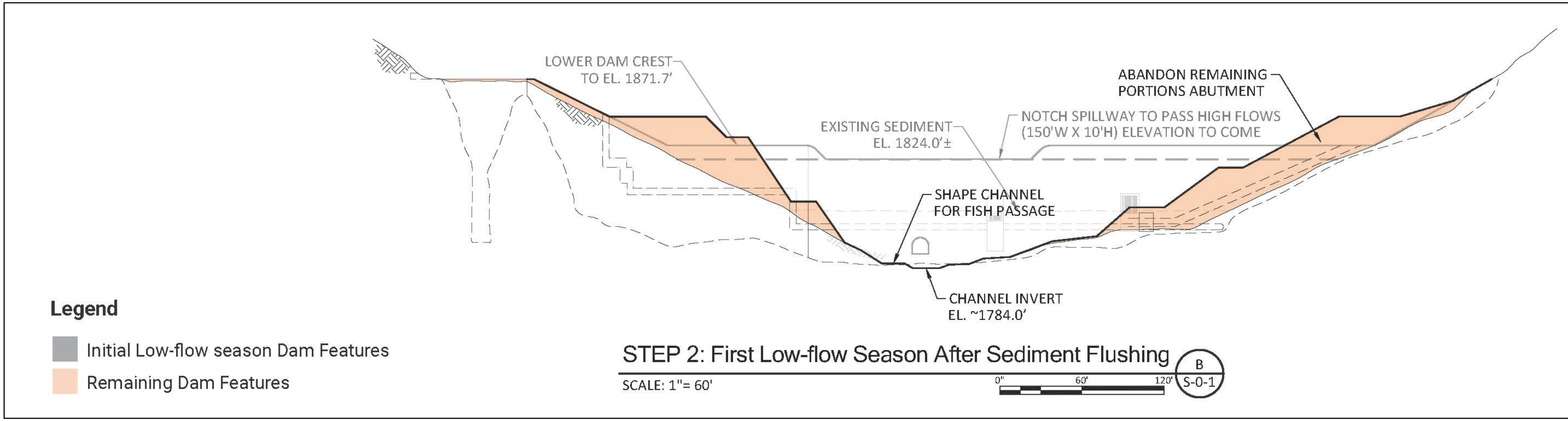


Figure 2-3. Scott Dam removal—final dam removal cross section (cross section—first low-flow season after sediment flushing).

This Page Intentionally Left Blank

Helicopters may be necessary to transport material to and from the construction site. It is assumed that helicopters would use Gravelly Valley Airport, located immediately north of Lake Pillsbury, shown on Map 2-2.

Rapid Dam Removal

Rapid Dam Removal includes activities within three specific seasons: (1) initial *low-flow season* (June–October) to dewater and remove the upper portion of the dam, (2) first *high-flow* season following removal of the upper portion of the dam for sediment flushing (November–May), and (3) first low-flow season after sediment flushing to complete final dam removal. Specific activities within each of the seasons are provided below.

Initial Low-flow Season Activities: June–October

- Develop a Water Diversion, Dewatering, and Hydrology Plan for resource agency review and approval following completion of engineering design. Upon resource agency approval, the plan will be implemented.
- Initiate reservoir drawdown after the runoff season when inflows are generally below 400 cfs, the approximate capacity of the needle valve.
  - The reservoir storage at the start of the drawdown period (June) will be approximately 50,000 ac-ft at an elevation of 1,900 ft. Completion of drawdown will occur in October at approximately 10,000 ac-ft of storage at an elevation of 1,861.7 ft.
  - To the extent possible, timing of drawdown (flow releases) will be coordinated with water demands in the East Branch Russian River.
  - Drawdown rates between approximately 1 and 2 ft. per day are proposed, consistent with the U.S. Society on Dams (USSD) *Guidelines for Dam Decommissioning Projects* (USSD 2015).
- Construct a temporary road (approximately 1,600 ft.) off Scott Dam Road to provide access to a temporary barge launch at the downstream terminus of the existing plunge pool below the dam (Map 2-8).
  - A barge will be placed at the launch site to move heavy equipment to the spillway apron. At the spillway apron, a ramp will be constructed to allow movement of construction equipment between the barge and spillway apron.
  - Road improvements to Scott Dam Road and Upper Scott Dam Road will also be completed to facilitate equipment access to the dam site (Map 2-8).
- Construct an adit tunnel (approximately 15 ft. in diameter; capacity of 7,000 cfs) in the base of the spillway, incorporating a temporary plug approximately 8 to 10 ft. from the upstream dam face.
  - PG&E will complete a concrete condition assessment and stability analysis during development of the final engineering design.

  - At the downstream terminus of the tunnel, a channel (approximately 80–90 ft. in length and 7.5–14.5 ft. deep) and concrete buttress will be constructed in the spillway apron to facilitate downstream sediment transport.

- Remove the upper portion of the dam (dam lowering and notching).
  - Dam removal design will be approved by FERC Dam Safety and DSOD prior to initiation of dam removal activities.
  - Dam removal activities will initially take place using barge-mounted equipment.
    - A small barge-mounted crane will be used to remove larger, removable appurtenances from the top of the dam (steel slide gates, radial gates, gate operating cylinders, hoists, and sheds).
  - Once the appurtenances have been removed from the top of the dam and spillway, a barge-mounted hydraulic impact hammer or similar equipment would then proceed with removal of the upper portion of the dam.
  - The lowered crest elevation would be between elevation 1,861.7 and 1,890.0 ft., leading to a total volume of demolished material between approximately 4,000 cy and 16,000 cy, respectively.
  - During dam lowering, a large notch (10–15 ft. deep and 150–200 ft. wide; overall discharge capacity between 15,000–40,000 cfs depending on head) will be constructed in the spillway.
  - Rubble and other material generated from the dam lowering and notching will be side-cast down the face of the spillway or placed on barges and hauled to a temporary holding area on PG&E-owned land near the dam for later placement.
    - Some large clean material from the dam (e.g., no rebar protruding, greater than approximately 2 ft. diameter) will be placed in the plunge pool area below the final river grade. Material will be large enough and placed deep enough that it will not be eroded/mobilized before the accumulated bedload in the reservoir is released and has an opportunity to occupy the space.
- Dredge sediments near the new tunnel intake.
  - Reservoir sediment deposits (estimated 15 ft. deep) immediately upstream of the concrete adit plug (tunnel intake) will be removed using a clamshell dredge or similar approach.

First High-flow Season Activities: November–May

- Remove the adit plug and initiate sediment flushing during the first high-flow season following dam lowering and notching.
  - Prior to the initiation of sediment flushing, the concrete plug in the adit tunnel near the upstream face of the dam (tunnel intake) will be drilled and explosives placed in the hole.

- Following pre-established protocols related to river flow forecasting, the explosives would be detonated during or preceding an anticipated flood event of sufficient magnitude to evacuate fine sediment deposits from the reservoir (likely between December and March).

First Low-flow Season After Sediment Flushing Activities: June–October

- Final dam removal activities during the first low-flow season following sediment flushing activities (June–October).
  - Demolition will occur using land-based heavy equipment such as hydraulic excavators and hoe rams and/or drilling and blasting techniques. Demolition using a crane and wrecking ball may also be used.
  - Dam removal includes cutting a section through the base of the dam to accommodate the bankfull flood and the 100-year flood.
  - The total volume of material constituting the lowered dam is roughly 115,000 cy. Approximately 80 percent of the material (approximately 92,000 cy) would be removed during demolition.
    - Some large clean material from the dam (e.g., no rebar protruding, greater than approximately 2 ft. diameter) will be stored in the portion of the plunge pool area below the final river grade.
    - The bulk of the remaining materials will be stored and capped on-site (e.g., along the left abutment, on the cribwall, and/or behind the remainder of the dam upstream of the pinnacle).

Recreation Facility Removal

All Project recreation facilities (i.e., campgrounds and day-use areas) and associated access roads will be removed (which are all located in the Scott Dam Area) with the exception of Trout Creek Campground (family and group campgrounds), and the sites will be restored. PG&E plans to remove the recreation facilities simultaneously with dam removal activities. Refer to Table 2-8 for a list of recreation facilities and associated roads and to Map 2-9 for the locations of these facilities. A site-specific engineering design will be developed for recreation facilities to be decommissioned that will include:

- Detailed description of facility decommissioning;
- Agency consultation process to determine underground utilities that would be left in place;
- Construction schedule;
- Public notification;
- Public access and signage requirements during construction; and
- Agency review and modification, if appropriate, of environmental measures considering site-specific engineering design.

Refer to the Decommissioning and Restoration Schedule below for the timing of site-specific engineering design development.

Construction Area

The construction area for Project recreation facility removal includes the facility footprint plus an established buffer as defined in Table 2-9. The construction area will encompass the construction work area, staging areas, and stockpile areas. Construction will be confined to the existing developed facility footprint and the construction area buffer. Refer to Map 2-9 for the locations of Project recreation facilities.

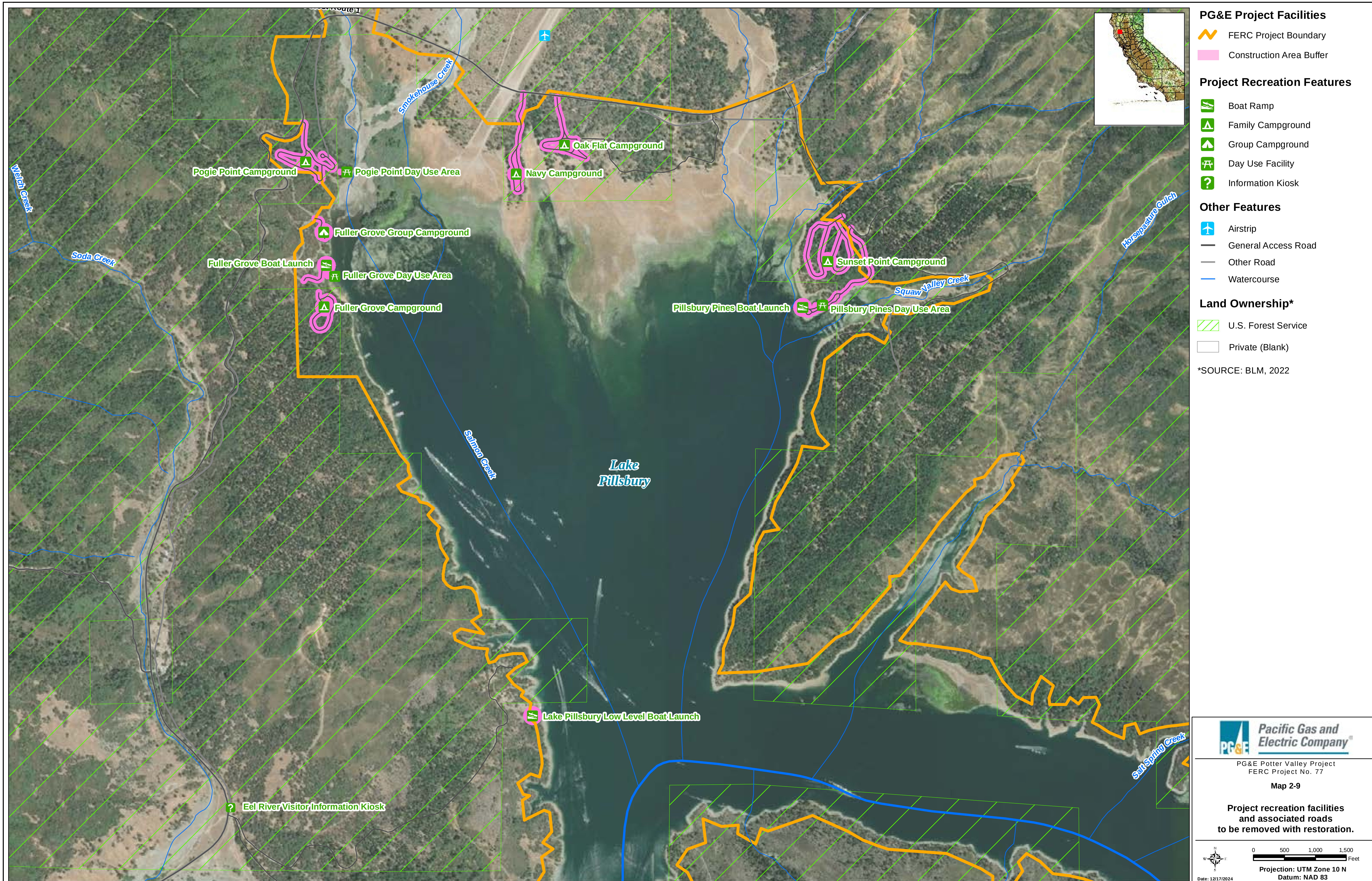
Table 2-9. Construction areas around recreation facilities in the Scott Dam Area.

Project Recreation Facility	Construction Area Buffer
Campgrounds	
Family Campgrounds	150 ft. around facility boundary
Family Campground Roads	50 ft. on either side of road
Group Campgrounds	150 ft. around facility boundary
Group Campground Roads	50 ft. on either side of road
Day-Use Facilities	
Kiosk	50 ft. around facility boundary
Boat Launch	150 ft. around facility boundary
Access Roads	50 ft. on either side of road
Day-Use Areas	50 ft. around facility boundary

Cape Horn Dam Area

The following provides a description of decommissioning of Project facilities and features located in the Cape Horn Dam Area. PG&E would decommission the Project facilities such that the Project would be removed from FERC and DSOD jurisdiction and eliminate PG&E's generation capabilities. Facilities in this area include Cape Horn Dam, Van Arsdale Reservoir, Potter Valley Powerhouse, and associated Project facilities and features including the tunnels, adits, conduits, and penstocks.

PG&E has reviewed the associated Project support facilities and features in the Cape Horn Dam Area. Table 2-10 provides a summary of decommissioning and transfer of Project facilities and features in the Cape Horn Dam Area and associated existing land ownership. Decommissioning of Project facilities and features includes leaving the facility in place (L), full or partial removal of the facility with restoration (RR), removal of the facility with no restoration (X), transfer of Project facilities necessary for the NERF to ERPA and removal from the FERC license (T), and transfer of the Project facility to a third party (other than ERPA) and removal from the FERC license (TT).



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\RecreationMaps\Map 2-9_LakePillsbury_RecFac_Removal_17i11i_10.mxd

This Page Intentionally Left Blank

Table 2-10. Decommissioning of Project facilities and features in the Cape Horn Dam Area.

Project Facility/Feature	Land Ownership	Decommissioning
Cape Horn Dam	PG&E	RR/T
Cape Horn Dam Instream Flow Release	PG&E	X
Reservoir		
Van Arsdale Reservoir	PG&E	RR
Intake Structures		
Van Arsdale Diversion Intake	PG&E	T
Tunnels and Adits		
Tunnel No. 1	PG&E	T
Tunnel No. 2	PG&E	T
Tunnel No. 1 Slide Gate and Adit	PG&E	T
Tunnel No. 1 Gage Shaft	PG&E	T
Conduits, Penstocks, Control and Valve Houses		
Conduit No. 1 (Upper Wood Stave, Steel Pipe and Components)	PG&E	T
Conduit No. 2 (Lower Wood Stave, Steel Pipe and Components)	PG&E	T
Conduit No. 1, 72-in. Butterfly Valve House	PG&E	T
Conduit No. 1 Standpipe and Surge Chamber Vent	PG&E	T
Penstock No. 1	PG&E	T
Penstock No. 2	PG&E	T
Penstock Nos. 1 and 2, 60-in. Gate Valves (2)	PG&E	T
Penstock Bypass Channel	Private/PG&E	T
Powerhouse Bypass System	PG&E	T
Powerhouse, Switchyard, and Tailrace		
Potter Valley Powerhouse	PG&E	T (Disconnect equipment/Remove fluids)
Potter Valley Powerhouse Switchyard	PG&E	T (Disconnect turbines/Retain station service transformers)
Potter Valley Powerhouse Tailrace, Radial Gate, and Venturi Flume	PG&E	T
Potter Valley Powerhouse Discharge Canal	PG&E/Private	T

Project Facility/Feature	Land Ownership	Decommissioning
Diversion Gages		
E5 - Potter Valley Irrig CN E5 NR Potter Valley CA (11471105)	PG&E	T
E6 - Potter Valley Irrig CN E6 NR Potter Valley CA (11471106)	PG&E	T
E16 - Potter Valley PH Intake near Potter Valley CA (11471000)	PG&E	T
River Gages		
E11 - Eel River at Van Arsdale Dam near Potter Valley CA (11471500)	PG&E	T
Leakage Weirs and Piezometers		
Cape Horn Dam Leakage Weirs	PG&E	T
Cape Horn Dam Piezometers	PG&E	T (Cap)
Fish Screen and Associated Facilities		
Van Arsdale Fish Screen Facility	PG&E	T
Van Arsdale Fish Screen Facility Back-up Generator Building	PG&E	T
Van Arsdale Fish Screen Facility Motor Control Building	PG&E	T
Van Arsdale Fish Return Channel	PG&E	T
Storage Building	PG&E	T
Fish Ladder and Associated Facilities		
Cape Horn Dam Fish Ladder Inlet/Outlet	PG&E	X
Cape Horn Dam Fish Ladder	PG&E	X
Fish Attraction Facility (Fish Hotel and Exclusion Barrier)	PG&E	X/T
Cape Horn Dam Fish Ladder Rock Fall Fence	PG&E	T
Cape Horn Dam Fish Ladder Intake/Outlet Debris Boom	PG&E	X
Project Communication/Powerlines		
Conduit No. 1, 72-in. Butterfly Valve House Communication	PG&E	T
Cape Horn Dam Control Building Communication/Powerline	PG&E	T
Fish Screen Facility Communication/Powerline	PG&E	T
Tunnel No. 1 Slide Gate and Adit Communication/Powerline	PG&E	T
Penstock Nos. 1 and 2, 60-in. Stop Valves Communication/Powerline	PG&E	T
Helicopter Landing Sites		
Potter Valley Powerhouse Helicopter Landing Site	PG&E	T

Project Facility/Feature	Land Ownership	Decommissioning
Ancillary and Support Facilities		
Potter Valley Powerhouse Operators Office	PG&E	T
Potter Valley Powerhouse Maintenance Office	PG&E	T
Potter Valley Powerhouse Operators Restrooms	PG&E	T
Project Facility Access Roads		
Cape Horn Dam East Access Road	PG&E	T
Intake Access Road	PG&E	T
Penstock, Pipeline, and Butterfly Valve House Access Road *(access for private landowner)*	Private/PG&E	T
Powerhouse Main Access Road	PG&E	T
Project Facility Access Trails		
Gage E11 Access Trail	PG&E	T
Project Recreation Facilities and Access Roads		
Trout Creek Campground	PG&E	TT
Trout Creek Campground Loop Rd	PG&E	TT
Trout Creek Group Campground	PG&E	TT
Trout Creek Campground Rd	PG&E	TT

Cape Horn Dam and Associated Project Facility/Feature Removal

PG&E will lower Cape Horn Dam to a level that will not impound water and will allow for volitional fish passage and unimpaired Eel River flows. Lowering of the dam will also allow for development of in-water NERF facilities. Refer to Section 2.2.2 for a description of construction of the NERF facilities. The description of removal of Cape Horn Dam is based on the *Potter Valley Project Diversion Facility Assessment, Preliminary Engineering Report* (McMillen 2024), existing site conditions, and technical expertise. The removal approach is described below. Note that Cape Horn Dam Area elevations cited herein are based on NAVD88.

Removal of Cape Horn Dam would be completed in 12 to 18 months and consists of establishing construction access, dewatering and sediment removal behind the dam, lowering of the dam, removal of cofferdams and reestablishment of the channel following construction of the NERF (Section 2.2.2). The approximate volume of sediment behind Cape Horn Dam ranges from approximately 640,000 to 1,700,000 cy of material, depending on the estimation method. See Map 2-10 and Figures 2-4 and 2-5 for plan and section views of the dam removal.

Construction Area

The construction area for Cape Horn Dam removal and associated facilities/features includes all areas necessary for construction, including the construction work area, site access improvements, staging areas, and stockpile areas. Refer to Map 2-10 for the Cape Horn Dam construction area. Staging and stockpile areas necessary for removal of the dam and decommissioning of facilities and features will be established on currently developed and disturbed areas within the construction area.

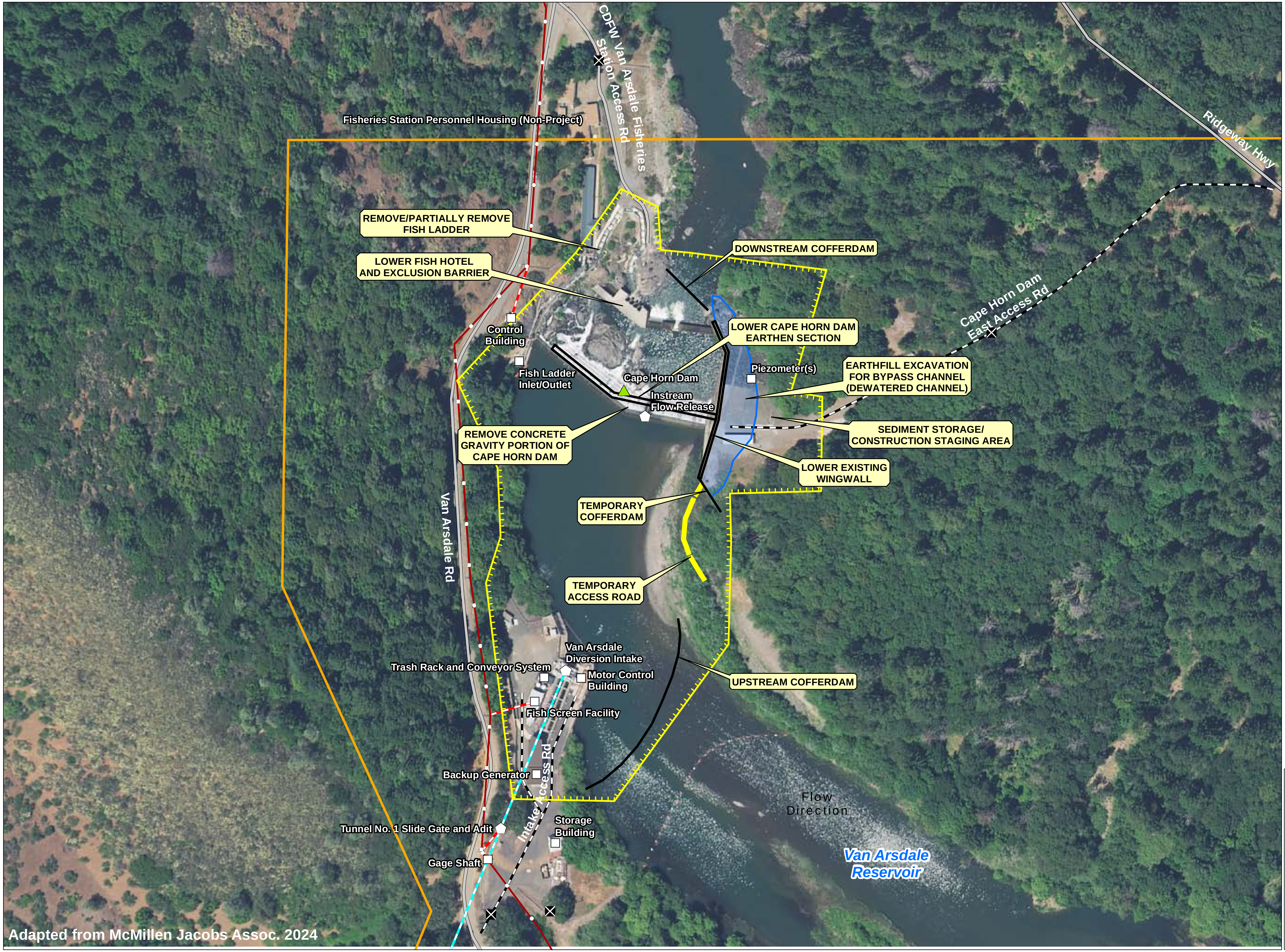
Helicopters may be necessary to transport material to and from the construction site. The helicopter landing site is identified on Map 2-6b.

Dam Removal

Cape Horn Dam Removal includes activities within two specific seasons: (1) low-flow season (March–October) to dewater, remove the dam and wingwall, and construct the NERF facilities (see Section 2.2.2.1) and (2) high-flow season (November–May) to remove cofferdams, reestablish unimpaired flows downstream of the dam following in-water construction, and allow remaining sediments impounded in the former reservoir to naturally flush downstream during subsequent high-flow events. Specific activities within each of the seasons are provided below. Refer to Section 2.2.2 for a description of construction activities for development of the NERF.

<u>Low Flow Season: March–October</u>

- Construct a temporary access road on the river right (looking downstream) from the dam to an area directly across from the existing fish screen (Map 2-10).
  - The access road is necessary to facilitate construction of a temporary cofferdam and channel through the earthen embankment along the existing dam wingwall to pass Eel River flows downstream.
- Construct a small cofferdam along the right bank of the river at the existing dam wingwall to isolate the earthen embankment portion of the dam. (Figure 2-6, Phase I)
  - Excavate and armor a channel through the earthen embankment to pass Eel River flows downstream during construction.
  - Lower the dam wingwall and provide structural stability improvements, if needed.
- When hydraulic conditions permit, install channel-spanning cofferdams upstream and downstream of Cape Horn Dam to isolate the work area (Figure 2-6, Phase II).
  - Tie a new upstream cofferdam into the left bank area (near the existing diversion facility) and remove the small wingwall cofferdam to allow Eel River flows to continue to pass downstream of the existing dam.
- Drain the isolated portion of the work area between the cofferdams using pumps and/or siphons.
  - Nuisance water would be pumped/siphoned on an ongoing basis during construction and passed downstream, into an alluvial settling basin and/or into the diversion tunnel.



PG&E Project Facilities

- Dam
- Water Conveyance Feature
- Ancillary and Other Facilities
- Water Conduit
- Power Line
- FERC Project Boundary

NOTE: Refer to Table 2.10 for the long-term fate of project facilities and features

Other Features

- Project Road
- Non-Project General Access Road
- Distribution or Powerline (Non-project)

Control Section with Pump Station Approach

- Existing Dam and Wingwall
- Construction Area

Proposed Action Features Labels

Surrender of License Proposed Action @ Cape Horn Dam

Pacific Gas and Electric Company

PG&E Potter Valley Project
FERC Project No. 77

Map 2-10

Cape Horn Dam
plan view and construction area

0 50 100 Feet

Date: 1/8/2025

Projection: UTM Zone 10 N
Datum: NAD 83

C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\FacilitiesMaps\DecomMaps\Map 2-10_CHD_PlanView_ConstArea_11i17i_10.mxd

This Page Intentionally Left Blank

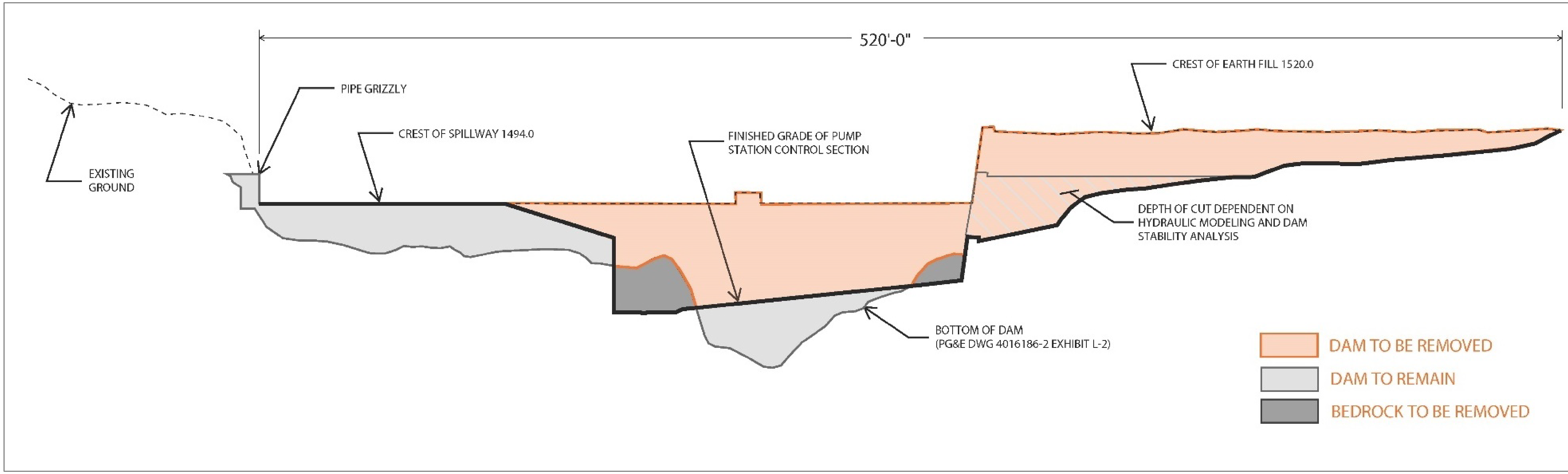


Figure 2-4. Cape Horn Dam removal plan—final dam removal (cross section through dam).

This Page Intentionally Left Blank

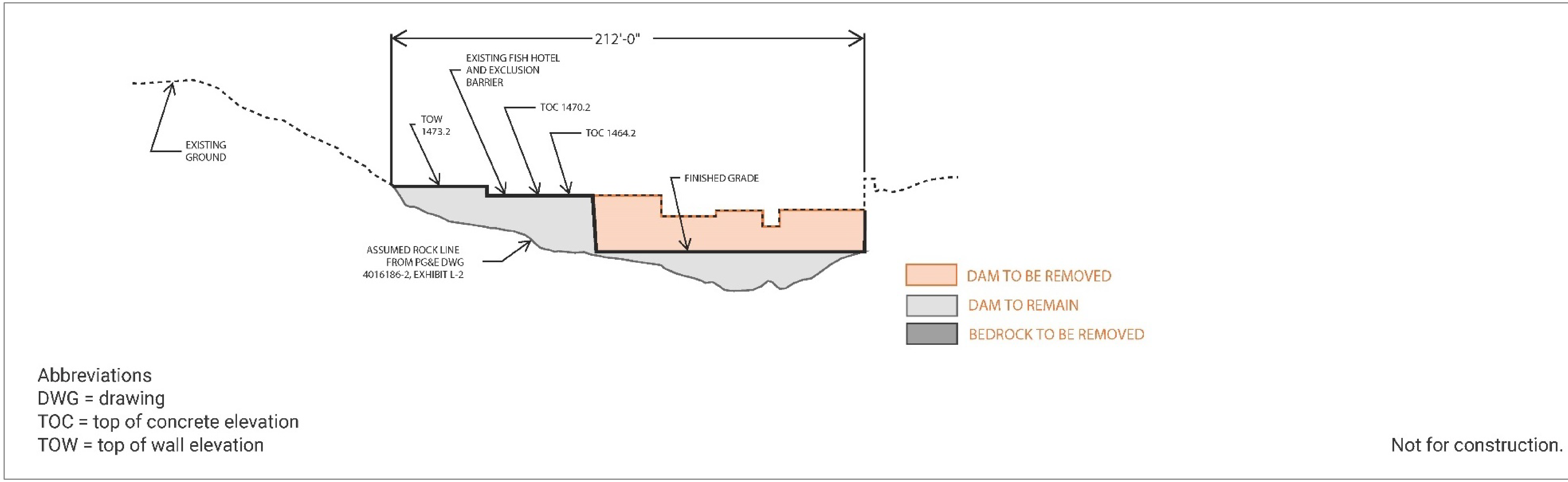


Figure 2-5. Cape Horn Dam removal (cross section through Fish Hotel and exclusion barrier).

This Page Intentionally Left Blank

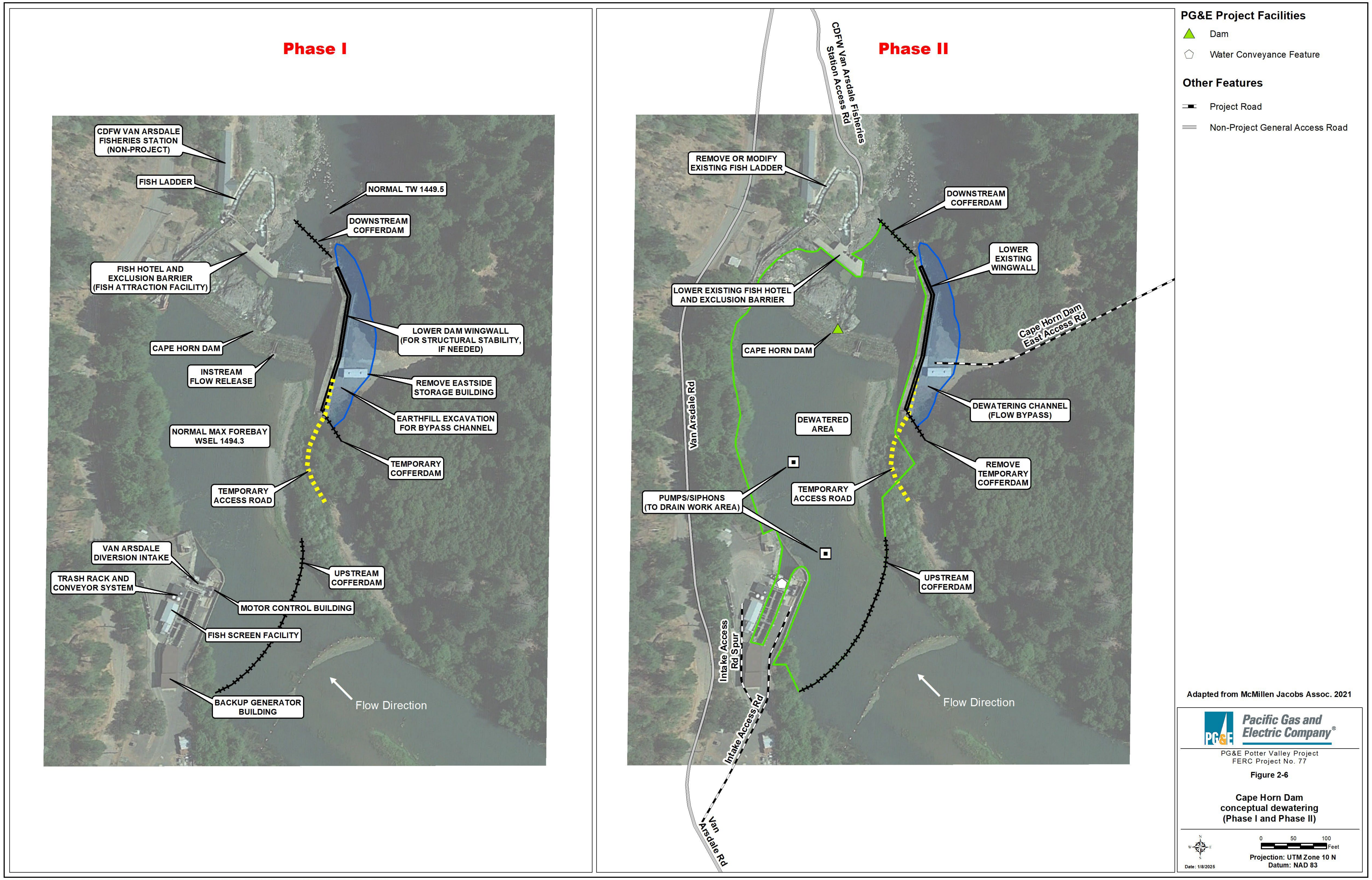


Figure 2-6. Cape Horn Dam conceptual dewatering (Phase I and Phase II).

This Page Intentionally Left Blank

- Remove sediment stored immediately upstream of the dam to allow access for heavy equipment to begin demolition.
  - Sediment would be placed on adjacent PG&E land for future disposal.
  - Approximately 40,000 to 50,000 cy of sediment would be excavated to provide access to develop the control section. The remainder of the sediment would be removed mechanically or flushed passively once the cofferdams have been removed.
- Remove the concrete gravity portion of Cape Horn Dam from elevation 1,493.9 ft. (NAVD88) to between approximately 1,445.0 ft. and 1,450.0 ft. using land-based heavy equipment such as hydraulic high-traction excavators, hoe rams, and/or drilling and blasting.
  - Remove the dam beginning at the existing concrete wingwall on river right and gently slope downward toward river left to help concentrate flows near the NERF pump station intake. The dam would be removed down to approximately 1,450.0 to 1,445.0 ft. across a section approximately 150 ft. wide from the wingwall, to leave a 150-ft.-wide control section.[4] The remaining control section may expose dam foundation or bedrock along its length.
  - At the end of the control section (at river left), a small vertical section of the dam would remain in place, beyond which the dam would slope upward to match its existing crest elevation. The residual abutment is intended to prevent the river from backwatering around the NERF pump station at high flows. The size and shape of this small residual abutment would be developed based on additional hydraulic modeling and geotechnical evaluation.
  - The residual section between the wingwall on river right and the small vertical section of dam on river left would be sized to completely contain the 100-year flow.
  - The control section would also be designed to meet state and federal fish passage criteria across the range of fish passage design flows.
  - Store removed dam materials on adjacent PG&E land above the 100-year floodplain on river right (looking downstream) for future disposal or to be utilized as fill materials for development of the NERF (refer to Section 2.2.2).
- Lower the existing wingwall and earthen portion of the dam.
  - Lower the existing wingwall to an elevation between approximately 1,477 ft. and 1,482 ft. (NAVD88; elevation to be verified with hydraulic modeling and stability analysis) to help contain the 100-year flow between the remaining wingwall and the remaining left abutment and also improve the stability of the earthfill section of the dam.
  - Lowering the wingwall would require excavating (lowering) the earthen portion of the dam down to an approximate elevation between approximately 1,473.5 ft. and

[4] The purpose of the control section would be to (1) allow for volitional passage of salmonids across the range of fish passage design flows and (2) maximize the range of flows so that the pump intake screens are partially submerged.

1,478.5 ft. (NAVD88). This excavation would include partial demolition of the mass concrete corewall and possibly some of the reinforced-concrete corewall.

- Lower the existing Fish Hotel and exclusion barrier, and remove or modify the existing fish ladder.
  - Lower the existing Fish Hotel and exclusion barrier (located approximately 100 ft. downstream of the control section) to an elevation approximately 1 ft. below the lowest elevation of the control section to (1) provide unimpeded flow of water through the control section and (2) provide fish passage through the control section.
  - Remove or partially remove the existing fish ladder at Cape Horn Dam by cutting the walls down to surrounding grade and infilling the pools with flowable fill or similar material. All appurtenances associated with the fish ladder would also be removed.

High Flow Season: November–May

- Following PG&E's decommissioning work at Cape Horn Dam and construction of the NERF retaining wall and new pump station (refer to Section 2.2.2), the cofferdams would be removed (starting with downstream cofferdam and then proceeding to upstream cofferdam), and unimpaired flows would be established to the Eel River (November–January). This will allow remaining sediments impounded in the former reservoir to naturally flush downstream during subsequent high-flow events during the next high-flow season.

Removal of NERF Facilities and Lands from FERC License

As part of the Surrender Application, PG&E is requesting that FERC include a condition in the Surrender Order to remove Project lands and facilities occupied by the NERF from the FERC license once (1) PG&E has completed decommissioning work at Cape Horn Dam and other project works associated with the NERF, (2) the NERF retaining wall and new pump station have been constructed, and modifications at the Potter Valley Powerhouse have been completed, and (3) PG&E has filed a completion report to FERC on these actions. Refer to Table 2-10 for a list of facilities that are necessary for the development of the NERF and would be transferred to ERPA. A map of facilities and lands to be removed would be developed and included in the Final Surrender Application.

Conceptual Restoration Plans

Under the Proposed Action, PG&E will develop restoration plans to be implemented at Project dams and lake/reservoir and Project recreation facilities following completion of construction activities. The conceptual restoration plans will be included in the Final Surrender Application to be filed with FERC. Final restoration plans will be developed in collaboration with resource agencies following the filing of the Final Surrender Application. Final restoration plans would be updated, as necessary in consultation with resource agencies, following dam removal.

Table 2-11 provides the goals, by location, for the restoration plans. These goals would guide development of the conceptual restoration plans that would be included in the Final Surrender Application to be filed with FERC. Final restoration plans will be developed in collaboration with resource agencies following the filing of the Final Surrender Application.

Table 2-11. Restoration goals by location.

Location	Goal
Scott Dam Area	
Scott Dam	Stabilization of areas upstream and downstream of the former dam site, as appropriate, to prevent erosion
	Restoration of the Scott Dam work areas, staging areas, and areas where Project facilities/features were removed
	Reestablishment of channel conditions to support fish passage at the Scott Dam location.
Lake Pillsbury and Eel River from Scott Dam to Van Arsdale Reservoir	Conversion of lacustrine habitat to upland and riverine habitat
	Reestablishment/stabilization of the historical channels and floodplains of the Eel River, Rice Fork Creek, and other tributaries in the former reservoir
	Revegetation and stabilization of sediment in the former reservoir and upland areas in the former inundation zone, as necessary
	Reestablishment of fish passage in the Eel River (including critical riffles) and at downstream tributary confluences
	Reestablishment of fluvio-geomorphic and vegetation processes, sediment supply, and hydrology in the Eel River from Scott Dam to Van Arsdale Reservoir, including tributary passage
	Promotion of diverse aquatic habitat for fish and aquatic amphibians, reptiles, and invertebrates by allowing access to historical anadromous fish habitat upstream of the former dam and reestablishing fluvio-geomorphic processes
Recreation Facilities	Restoration (stabilization and revegetation) of Project recreation facility sites and associated construction work areas, staging areas, and stockpile areas
Cape Horn Dam Area	
Cape Horn Dam	Stabilization of areas upstream and downstream of the gravity portion of the dam site, as appropriate, to prevent erosion
	Restoration of the Cape Horn Dam work areas, staging areas, and areas where Project facilities/features were removed
	Revegetation and stabilization of sediment in the former inundation zone and upland area as necessary
	Reestablishment of fish passage at the remaining portion of Cape Horn Dam

Location	Goal
Van Arsdale Reservoir	Conversion of lacustrine habitat to a control section that would maintain a minimum bed elevation near the pump station intake screens within the former Van Arsdale Reservoir
	Reestablishment of fish passage in the Eel River and at downstream tributary confluences (downstream of Cape Horn Dam), if necessary
	Reestablishment of channel in the former Van Arsdale Reservoir
	Revegetation and stabilization of sediment in the former reservoir, including upland areas, as necessary
	Reestablishment of sediment transport and hydrology in the Eel River downstream of Cape Horn Dam, including tributary passage
	Promotion of diverse aquatic habitat for fish and aquatic amphibians, reptiles, and invertebrates by reestablishing fluvio-geomorphic processes

Decommissioning and Restoration Schedule

The decommissioning and restoration schedule is contingent on issuance of a Surrender Order and associated conditions for the Project. In general, decommissioning and restoration activities would follow a phased approach, as noted below:

- Pre-construction Activities:
  - Development of Final Engineering Plans
  - Development and Agency Review and Approval of Final Restoration Plans
  - Environmental Permitting
  - FERC Approval of Engineering Design
- Scott Dam Area Construction:
  - Scott Dam and Associated Project Facility/Feature Removal
  - Recreation Facility Removal
- Scott Dam Area and Recreation Facility Restoration
- Cape Horn Dam Area Construction:
  - Cape Horn Dam and Associated Project Facility/Feature Removal
- Cape Horn Dam Area Restoration

It is anticipated that decommissioning of Scott Dam and associated Project facilities/features would require 2 years (depending on site conditions and flows), removal of Cape Horn Dam and decommissioning of associated Project facilities/feature would take two construction seasons (*low-flow* and *high-flow* seasons). PG&E plans to remove the recreation facilities simultaneously with the dam removal activities. The duration of construction may change based on final engineering design. The construction season would extend from approximately March 1 to October 31, depending on weather conditions.

Permitting and Other Regulatory Approvals

Anticipated permitting requirements and authorizations necessary for decommissioning of Project dams and Project facilities/features under the Proposed Action are described in Volume I, Section 3.0.

2.2.2 Non-Project Use of Project Lands

PG&E requests that FERC authorize non-Project use of Project lands under License Article 5 of Form L-5 included in the FERC License Order issued December 4, 1983 (FERC 1983) as amended January 28, 2004 (FERC 2004). Specifically, PG&E requests authorization to allow ERPA to construct the NERF on lands within the FERC Project boundary. This application only requests authorization for construction of the new NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River, construction of retaining wall and a conduit from the pump station to the tunnel inlet, placement of fill behind the retaining wall, and modification of the Potter Valley Powerhouse. Other construction activities associated with the NERF and future operation of the facility by ERPA will require separate environmental analysis and permits/approvals to be completed by ERPA.

The type of conveyance (lease, right-of-way, easement, fee title) and acres of lands to be conveyed to ERPA by PG&E will be provided in the Final Application for Non-Project Use of Project Lands.

Provided below is a concept-level description of construction of the NERF retaining wall, pump station, the conduit from the pump station to the tunnel inlet, and modifications to the Potter Valley Powerhouse (Conceptual Construction Plan) (Section 2.2.2.1), as well as a description of the compatibility of the construction of these NERF facilities with the decommissioning of the Potter Valley Hydroelectric Project (Section 2.2.2.2).

2.2.2.1 Conceptual Construction Plan

ERPA would construct a new pump station to divert and convey water to the existing Van Arsdale tunnel inlet. The description of construction of the NERF is based on *the Potter Valley Project Diversion Facility Assessment, Preliminary Engineering Report* (McMillen 2024). Note that Cape Horn Dam Area elevations cited herein are based on NAVD88. The Conceptual Construction Plan represents ERPA's proposal for construction of the NERF. ERPA is currently conducting the engineering analysis necessary for the development of a detailed construction plan. Following submittal of the Final Application for Non-Project Use of Project Lands and FERC's issuance of the Surrender Order, PG&E would provide detailed construction plans for FERC review and approval.

The NERF conduit, retaining wall and pump station would be constructed in 6 to 7 months and take advantage of Eel River dewatering that would be completed for the removal of Cape Horn Dam. Refer to Section 2.2.1.1 for a description of dewatering and removal of Cape Horn Dam. See Maps 2-11a and 2-11b for the construction areas at Cape Horn Dam and Potter Valley Powerhouse, respectively, and Figure 2-7 for a conceptual profile of the control section with pump station. Figures 2-8 through 2-11 provide artistic renderings of the existing conditions and constructed NERF.

Construction Area

The construction area for development of the NERF retaining wall and pump station includes all areas necessary for construction of these facilities, including the construction work area, staging areas, and stockpile areas. Refer to Map 2-11a and 2-11b for the NERF construction area. Staging and stockpile areas necessary for construction of these NERF facilities would be established on currently developed and disturbed areas within the construction area.

Helicopters may be necessary to transport material to and from the construction site. The helicopter landing site is identified on Map 2-6b.

NERF Construction

Construction of the NERF retaining wall, fill, and pump station and modification of the Potter Valley Powerhouse would occur during the *Low-Flow Season* (May–October) when the area is dewatered for the removal of Cape Horn Dam. The cofferdams will be removed as part of the Surrender Application following PG&E's decommissioning work at Cape Horn Dam and construction of the NERF retaining wall and new pump station. Specific activities are provided below.

Low Flow Season: May–October

- Removal/repositioning sediment for construction access.
  - Continue sediment removal and repositioning upstream of the dam, to allow construction of the retaining wall and pump station.
- Construct new pump station and ancillary facilities.
  - Construct a new pump station (reinforced concrete structure) on river left adjacent to the control section of the dam (i.e., concrete gravity section). The pump station would be 80 to 100 ft. long in the river flow direction and approximately 50 to 70 ft. wide into the bank; the top wall would be set to exceed the anticipated 100-year flows at the pump station.
    - Set foundation and pile foundation support for outer wall and sill of pump station.
    - Construct the remainder of concrete pump station.
    - Prepare foundation support and foundation slab for cantilever retaining wall.
- Construct concrete retaining wall.
  - Construct a concrete retaining wall along river left running parallel with the flow between the pump station and the existing Van Arsdale diversion facility to serve as a lateral constraint to route water past the new pump station and through the control section and protect the facility. Refer to Section 2.2.1 for information on the control section.
- Construct a conduit from the pump station to the tunnel inlet behind the retaining wall.

- Place fill behind concrete retaining wall.
  - Use stockpiled material from dam removal and other material (if necessary) to backfill the new concrete retaining wall.
- Remove cofferdams (completed as part of the Surrender Application).
  - Following construction of the retaining wall, cofferdams would be removed as described in Section 2.2.1 as part of the Surrender Application.
- Potter Valley Powerhouse modifications and installation of energy dissipation valve and associated instrumentation.
  - Removal of Unit #1, including removal of the turbine, generator, governor, and pressure relieve valve, oil pump, cooling pumps, and all associated metal embeds in the concrete draft tube #1. Modifications would also include partial or complete filling of select pits with reinforced concrete and select demolition of the draft tube concrete to create space for installation of the new energy dissipation valve.
  - Install additional energy dissipation valve to bring the total capacity of the facility back up to 300 cfs. The energy dissipation valve would be operated to control the diversion flow rate through the tunnel system.
  - Install new blind flange upstream and downstream of the existing bifurcation valve located in a vault immediately north of the powerhouse.
  - Install instrumentation and controls necessary for reporting programmable logic controllers (PLC). This includes new flow gages at the control section and level sensors at the diversion facility, real-time water levels in Lake Mendocino, and potentially other sources.

Construction Schedule

Construction of the NERF pump station and retaining wall, placement of fill behind the retaining wall, and modification of the Potter Valley Powerhouse are contingent on issuance of Surrender Order to authorize diversion and dewatering of the Eel River and removal of Cape Horn Dam and FERC authorization of non-Project use of Project lands. In general, construction of the NERF pump station and retaining wall and placement of fill, and modification of the Potter Valley Powerhouse, would follow a phased approach, as noted below:

- Pre-construction activities:
  - Development of final engineering plans
  - Environmental permitting
  - FERC approval of the engineering design
- Construction of NERF retaining wall and pump station and modification of the Potter Valley Powerhouse.

- The permitting approach for NERF construction and operation is provided in Volume I, Section 3.0.
- It is anticipated that construction of the NERF pump station and retaining wall and modification of the Potter Valley Powerhouse would be completed within the same time period as PG&E's removal of Cape Horn Dam and associated Project facilities and features. The construction season will extend from approximately March 1 to October 31, depending on weather conditions.

Permitting and Other Regulatory Approvals

Anticipated permitting requirements and authorizations necessary for construction of the NERF under the NPUPL Proposed Action are described in Volume I, Section 3.0.

2.2.2.2 Compatibility Evaluation

Compatibility with PG&E's Existing FERC License

The proposed non-Project use of Project lands would not conflict with PG&E's existing FERC license articles that could be applicable to the non-Project use of Project lands, as follows (see Section 2.1.3).

Table 2-12. Non-Project Use of Project Lands Compatibility with FERC License.

License Article	Summary of License Articles	Non-Project Use of Project Lands Compatibility with Existing FERC License
Article 2	No substantial changes may be made in the plans, maps, specifications, and statements in the exhibits until approved by FERC.	All plans, drawings, and specifications within the FERC Project boundary will be submitted to FERC and DSOD for approval prior to construction, consistent with Article 2.
Article 17	Requires the Licensee to construct, maintain, and operate reasonable recreational facilities as directed by FERC, or as recommended by other Federal or State agency after an opportunity for a hearing.	There are no designated recreation use facilities in the area of the proposed NERF project, nor would access to any existing recreation facilities be impacted by the project, consistent with Article 17.
Article 18	Requires the Licensee to allow the public free access, to a reasonable extent (safety considerations), to Project waters and adjacent Project lands owned by the Licensee.	There are no designated recreation use facilities in the area of the proposed NERF construction, nor would access to any existing recreation facilities be impacted by the project, consistent with Article 18.
Article 19	Requires the Licensee to take reasonable measures to prevent soil erosion on land adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution resulting from Project construction, operation, or maintenance.	For the purposes of NERF construction, ERPA will implement environmental measures to prevent soil erosion that may affect streams or other waters from construction, consistent with Article 19.

License Article	Summary of License Articles	Non-Project Use of Project Lands Compatibility with Existing FERC License
Article 21	Requires the Licensee only conduct dredge and fill activities in association with work specifically authorized under the license; during maintenance of the Project; or after obtaining FERC approval.	For the purposes of NERF construction, EPRA will obtain Section 404 permits, consistent with Article 21.
Article 27	Requires the Licensee to prevent, control, and suppress fires on Project lands.	During NERF construction, ERPA will implement its Construction Fire Plan, consistent with Article 27.
Article 31	Requires state or federal jurisdictional approval over the location and standards of roads and trails; and other uses of land, including quarries, borrow pits, and spoil disposal areas during construction and maintenance.	ERPA will obtain all necessary permits for FERF construction, consistent with Article 31.
Article 42	Requires the Licensee, prior to implementation of any construction projects, to consult with the California State Historic Preservation Officer (SHPO) to develop and implement a study for the identification and protection of cultural resources that may be affected by operation and maintenance of the Project.	ERPA will consult with SHPO. Regarding NERF construction. ERPA will develop a Historic Properties Management Plan according to the Section 106 process such as a Programmatic Agreement and/or Historic Properties Management Plan that will include additional studies to identify effects and measures to avoid or mitigate adverse effects to cultural and Tribal resources.
Article 46	Requires Licensee to continue to consult and cooperate with appropriate Federal, state, and other natural resources agencies for the protection and development of the environmental resources and values of the Project area.	ERPA will obtain all necessary permits for NERF construction, consistent with Article 46.
Article 52	Requires the Licensee to file for FERC approval a plan to implement and comply with NOAA Fisheries' Reasonable and Prudent Alternative, and Reasonable and Prudent Measures of the Biological Opinion filed by NOAA Fisheries on November 29, 2002.	NERF construction will not affect PG&E's ability to comply with the current RPA minimum instream flows. Following removal of Scott Dam, natural (unimpaired) hydrology would pass through the Eel River downstream to Cape Horn Dam. Stored water in Lake Pillsbury will not be present to maintain the current RPA minimum instream flows in the Eel River or the East Branch Russian River when the natural hydrology is not sufficient to meet those requirements.
Article 54	Requires the Licensee to file for FERC approval a plan to conduct or fund annual surveys to identify and monitor nesting, perching, and foraging areas used by bald eagles in the Lake Pillsbury area.	ERPA will comply with PG&E's existing Bald Eagle Management Plan with respect to any actions it undertakes for NERF construction, and it will implement the proposed Bald Eagle Conservation Plan, consistent with Article 54.

PG&E finds the proposed use consistent with the existing FERC license for the Potter Valley Hydroelectric Project.

ERPA will construct the components of the NERF, including modification of the Potter Valley Powerhouse (Section 2.2.2.), in the same season as PG&E's removal of Cape Horn Dam; therefore, this segment of the Eel River would be dewatered only once for in-water NERF and Cape Horn Dam decommissioning construction activities. ERPA will implement proposed avoidance and protection measures (Section 2.2.3) and adhere to measures required by their permits to address potential effects of construction of specific components of the NERF (NERF retaining wall and pump station and modification of the Potter Valley Powerhouse) to environmental and cultural resources. These measures would not be expected to conflict with PG&E's short-term construction measures and post-facility removal measures and plans (Section 2.2.3) or requirements contained in the Commission's Surrender Order. During construction of the components of the NERF (NERF retaining wall and pump station and modification of the Potter Valley Powerhouse), ERPA would comply with any additional applicable requirements in the Surrender Order.

Compatibility with Decommissioning

PG&E would decommission Project facilities such that the Project would be removed from FERC and DSOD jurisdiction and eliminate PG&E's generation capabilities[5]. Following construction of the NERF retaining wall and pump station, modification of the Potter Valley Powerhouse, and PG&E's decommissioning of Cape Horn Dam and filing of a completion report with FERC, all necessary facilities and lands for the NERF would be removed from the Project boundary and FERC jurisdiction. Under a separate environmental review process, ERPA would obtain all necessary permits and approvals for additional construction activities and to allow for operation of the NERF and continued diversion to the East Branch Russian River.

Construction of specific components of the NERF (NERF retaining wall and pump station and modification of the Potter Valley Powerhouse) would be consistent with the goals of PG&E's Conceptual Restoration Plan in the Cape Horn Dam Area, as follows:

[5] Generation at the Potter Valley Powerhouse was discontinued in 2021.

Table 2-13. Non-Project Use of Project Lands compatibility with Restoration Plan goals.

Location	Proposed Conceptual Restoration Plan Goals	Non-Project Use of Project Lands Compatibility with Restoration Plan Goals
Cape Horn Dam	Stabilization of areas upstream and downstream of the gravity portion of the dam site, as appropriate, to prevent erosion.	The NERF will be constructed within the segment of the Eel River that will be dewatered for PG&E's removal of Cape Horn Dam. ERPA and PG&E will comply with proposed environmental measures to minimize erosion during and following construction.
	Restoration of the Cape Horn Dam work areas, staging areas, and areas where Project facilities/features were removed.	The NERF will be constructed within the segment of the Eel River that will be dewatered for PG&E's removal of Cape Horn Dam. PG&E will restore the disturbed area as required by the Restoration Plan.
	Revegetation and stabilization of sediment in the former inundation zone and upland area as necessary.	The NERF will be constructed within the segment of the Eel River that will be dewatered for PG&E's removal of Cape Horn Dam. PG&E will restore the disturbed area as required by the Restoration Plan.
	Reestablishment of fish passage at the remaining portion of Cape Horn Dam.	The NERF's design will be compatible with PG&E's goal at Cape Horn Dam: to lower Cape Horn Dam to a level that will not impound water and will allow for volitional fish passage and unimpaired Eel River flows.
Van Arsdale Reservoir	Conversion of lacustrine habitat to a control section that would maintain a minimum bed elevation near the pump station intake screens within the former Van Arsdale Reservoir.	The NERF's design will be compatible with PG&E's goal at Cape Horn Dam: to lower Cape Horn Dam to a level that will not impound water and will allow for volitional fish passage and unimpaired Eel River flows.
	Reestablish fish passage in the Eel River and at downstream tributary confluences (downstream of Cape Horn Dam), if necessary.	The NERF's design will not impede fish passage in the Eel River.
	Reestablish of the channel in the former Van Arsdale Reservoir.	The NERF's design will be compatible with PG&E's goal at Cape Horn Dam: to lower Cape Horn Dam to a level that will not impound water and will allow for volitional fish passage and unimpaired Eel River flows. PG&E will restore the disturbed area as required by the Restoration Plan.
	Revegetation and stabilization of sediment in the former reservoir, including upland areas, as necessary.	The NERF will be constructed within the segment of the Eel River that will be dewatered for PG&E's removal of Cape Horn Dam. PG&E will restore the disturbed area as required by the Restoration Plan.
	Reestablishment of sediment transport and hydrology in the Eel River downstream of Cape Horn Dam, including tributary passage.	The NERF's design will be compatible with PG&E's goal at Cape Horn Dam: to lower Cape Horn Dam to a level that will not impound water and will allow for volitional fish passage and unimpaired Eel River flows. PG&E will restore the disturbed area as required by the Restoration Plan.

2.2.3 Proposed Environmental Measures

Provided below is a description of environmental measures to be implemented during decommissioning (construction and deconstruction) activities implemented under the Proposed Action for the Surrender Application and construction activities implemented under the Application for Non-Project Use of Project Lands (Section 2.2.3.1) and environmental measures that will be implemented following removal of the Project dams and associated facilities/features and recreation facilities (Section 2.2.3.2).

Final measures and plans will be developed in consultation with resource agencies and other interested parties following PG&E's filing of the Final Application for Surrender of License and Non-Project Use of Project Lands in July 2025.

2.2.3.1 Short-term Construction Measures

Under the Proposed Action for the Surrender Application (Project Action) and Application for Non-Project Use of Project Lands (NPUPL Proposed Action), resource protection measures will be implemented during construction associated with decommissioning the Project (PG&&E; Surrender Application) (Table 2-14) and construction of the NERF (ERPA; Application for Non-Project Use of Project Lands) (Table 2-15). These include implementation of best management practices (BMPs), general construction measures, avoidance and protection measures, construction monitoring, and public outreach notifications.

Following completion of site-specific engineering designs, PG&E will review the measures with resource agencies for adequacy in protecting resources. If additional site-specific construction measures are necessary, or existing measures require modification, they would be developed in consultation with resource agencies and implemented as part of construction activities.

2.2.3.2 Post-facility Removal Measures

Under the Proposed Action for the Surrender Application, PG&E will implement resource protection measures following removal of Project dams and associated facilities/features and recreation facilities. Proposed resource protection measures to be implemented under the Proposed Action are provided in Table 2-16. Table 2-16 includes the goals of the measure, indicates any sub-measures, if applicable, and lists the primary elements of the measure. The detailed content of these measures will be developed after PG&E's July 2025 filing of the Final Surrender Application with FERC.

Following completion of the engineering designs, PG&E will review the measures with resource agencies for adequacy of protecting resources and will consult with resource agencies if additional measures or plans are necessary or existing measures require modification.

Table 2-14. Avoidance and protection measures and best management practices to address and reduce potential effects to environmental and cultural resources during decommissioning of the Potter Valley Hydroelectric Project.

Protection, Mitigation, and Enhancement Measures
General Construction Measures
All contractors and staff will be made aware of the ecological and cultural resource values of each site and will be given instructions to comply with site-specific avoidance and protection measures and BMPs.
Construction activities will be limited to a designated work area (including the work corridor and staging area). The work area will be clearly identified on the construction drawings and shall be staked and flagged where necessary prior to initiation of construction activities.
Construction activities will be implemented 10 hours per day, beginning after sunrise (but no earlier than 7:00 a.m.) and ending before sunset (but no later than 7:00 p.m.), Monday through Saturday.
PG&E will implement noise measures to address and reduce potential construction-related noise impacts, such as the following: • Reduce number of days of flights by condensing more trips into workdays while increasing the number of days with no flights. • Ensure that construction equipment utilizes the manufacturer's recommended/provided mufflers and that they are functioning as designed. • Use of engine braking shall be prohibited. • Helicopter use will be limited to 8:00 a.m. to 4:00 p.m., Monday through Saturday, except in emergency situations. • To the extent feasible, utilize previously established helicopter flight paths to reduce impacts to noise-sensitive receptors. • To the extent feasible, utilize helicopter flight path routes that avoid noise-sensitive receptors. • To the extent feasible, communicate helicopter flight operations with the public ahead of time.
PG&E will implement emission reduction measures, such as the following: • Clean construction vehicles leaving the site to prevent dust, silt, mud, and dirt from being released or tracked offsite. • Dry mechanical sweeping and use of blower devices are prohibited. All visible trackout material from vehicles leaving the work site shall be removed from paved, public streets using wet sweeping or a high-efficiency particulate air filter equipped vacuum device. • Suspend grading and earthmoving operations if wind speeds are high enough to result in dust emissions crossing the construction work area boundary despite the application of dust mitigation measures. • Prevent dust emissions from materials hauled offsite by adequately wetting all loads and either covering completely with tarps or ensuring at least 6 inches of freeboard on the front, back, or sides of the cargo compartment and that no point of the load extends above the top of the cargo compartment. • Depending on equipment availability, require that all diesel construction engines with a rating of 50 horsepower or greater meet, at a minimum, the Tier 4 California emission standards for off-road engines (13 CCR 2423[b][1][B]). • Consistent with the California Air Resources Board's In-Use Off-Road Diesel-Fueled Fleets Regulation, require contractors to limit idling of construction vehicles and equipment onsite to 5 minutes or less unless idling is necessary for effective work progress or equipment operation. • Require contractors to maintain construction equipment in proper working order and in accordance with manufacturer specifications.

Protection, Mitigation, and Enhancement Measures
PG&E will implement air quality measures to address and reduce potential fugitive dust emissions during construction: • Stabilize unpaved areas subject to vehicle traffic by watering, treating with a non-toxic chemical dust suppressant, or covering. • Stabilize storage piles and disturbed areas not subject to vehicular traffic by keeping wet, treating with a non-toxic chemical dust suppressant, or covering when material is not being added to, or removed from, the pile. • Prior to any ground disturbance, including grading, excavating, and land clearing, apply sufficient water to the area to be disturbed to limit dust and minimize emissions. • Clean construction vehicles leaving the site to prevent dust, silt, mud, and dirt from being released or tracked offsite. • Dry mechanical sweeping and use of blower devices are prohibited. All visible trackout material from vehicles leaving the work site shall be removed from paved, public streets using wet sweeping or a high-efficiency particulate air filter equipped vacuum device. • Suspend grading and earthmoving operations if wind speeds are high enough to result in dust emissions crossing the construction work area boundary despite the application of dust mitigation measures. • Prevent dust emissions from materials hauled offsite by adequately wetting all loads and either covering completely with tarps or ensuring at least 6 inches of freeboard on the front, back, or sides of the cargo compartment and that no point of the load extends above the top of the cargo compartment.
PG&E will develop and implement a Construction Transportation Management Plan. • Harden heavily used parking area surfaces. • The plan shall include, but is not limited to, the following items: – Guidance on the number and size of trucks per day entering and leaving the Project site; – Identification of arrival/departure times that would minimize traffic impacts. Staff shall commute during off-peak hours; – Approved truck circulation patterns and haul routes; – Locations of staging areas; – Locations of employee parking; – All construction employees shall park in designated lots owned by the Project applicant or on private lots otherwise arranged for by the Project applicant; – Methods for partial/complete street closures (e.g., timing, signage, location, and duration restrictions); – Criteria for use of flaggers and other traffic controls; – Preservation of safe and convenient passage for bicyclists and pedestrians through/around construction areas, as applicable. Roadways, unmarked crosswalks, and bicycle facilities (e.g., roadway shoulders that could be used by bicyclists) shall be maintained clear of debris (e.g., rocks) that could otherwise impede travel and impact public safety; – Monitoring for roadbed damage and timing for completing repairs; – Preservation of emergency vehicle access; – Removing traffic obstructions during emergency evacuation events; – Public notification regarding planned road use by haul trucks and workers, including dates and times of construction activities; and – Providing a point of contact for residents to obtain construction information, have questions answered, and convey complaints.

Protection, Mitigation, and Enhancement Measures
Biological Resources
General Wildlife Measures
To avoid the entrapment of small animals (e.g., amphibians or small mammals), PG&E will do the following: • Cover open excavations at the end of each workday or install escape ramps. • Inspect open excavations prior to the initiation of each workday. • If any animal is found entrapped in an excavation and cannot leave of its own accord (e.g., using escape ramps or other passive methods), workers will follow the protocol for previously undiscovered species. • Animals will not be handled except by appropriately permitted individuals.
Protocol for previously undiscovered species: • Observations of special-status species and tule elk will be reported to the PG&E Environmental Resources Manager as soon as practicable. • All activities that have the potential to result in harassment, injury, or death of any animal will cease until the animal moves out of harm's way on its own accord. • Work may resume after the animal moves out of harm's way. • Animals will not be handled except by appropriately permitted individuals.
To the degree possible, large trees (35 inches in diameter at breast height [DBH] or greater) would be avoided during construction.
Bald Eagle Conservation Plan
PG&E will develop a Bald Eagle Conservation Plan. Goal: Define Measures to Protect Bald Eagles During Construction Activities • Pre-construction Nest Survey: – The year prior to construction and prior to each subsequent construction period, PG&E will implement pre-construction bald eagle surveys consistent with the methods described in License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). – PG&E will submit Nest Survey Forms to the USFS and CDFW raptor coordinator consistent with the reporting requirements under License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). Survey forms will also be submitted to USFWS. • Following completion of pre-construction nest surveys, PG&E will complete analysis to determine the nest location and timing in relation to proposed construction activities (e.g., blasting, helicopter flight paths, heavy equipment use) and the National Bald Eagle Management Guidelines nest protection no-disturbance buffers (USFWS 2007). USFWS guidelines specify the following no-disturbance buffers: – A 0.5-mile no-disturbance buffer for blasting activities; – A 660-foot no-disturbance buffer for use of heavy equipment and general construction activities; and – A 1,000-foot no-disturbance buffer (horizontal/vertical) for helicopters and fixed-wing aircraft.

Protection, Mitigation, and Enhancement Measures
• If active nests are present within the USFWS-recommended no-disturbance buffer of recreation facilities and ancillary support facilities (not necessary for dam removal), PG&E would modify the timing of the construction and/or the helicopter flight paths to provide the no-disturbance buffer during the nesting season (January 1–August 31) until the nest is no longer active, as determined by a qualified biologist. • If active nests are present within the USFWS-recommended no-disturbance buffer of Scott and Cape Horn Dam removal (including ancillary facility removal necessary for dam removal), the following would be implemented during the nesting season (January 1–August 31), to the extent possible: – Modify the helicopter paths to provide no-disturbance buffer. – Modify timing of construction activities to take place outside the nesting season (i.e., September 1–December 31). – If it is determined that construction activities cannot be modified (timing/location) to provide the no-disturbance buffer, prior to the initiation of ground-disturbing activities, PG&E will consult with USFWS and obtain take authorization under the Bald and Golden Eagle Protection Act. • To the extent possible, any tree removal would be conducted outside the general avian nesting season (i.e., September 1–December 31).
Northern Spotted Owl Management Plan
PG&E will develop a Northern Spotted Owl Management Plan. Goal: Define Appropriate Measures to Protect Northern Spotted Owl During Construction Activities in the Scott Dam Area • Pre-construction Agency Consultation: – Prior to the Initial Low-Flow Season, PG&E will coordinate with USFWS and Mendocino National Forest to obtain the most recent information on northern spotted owl habitat and/or nests within 1 mile of the construction area. • Pre-construction Nest Surveys: – The year prior to the Initial Low-Flow Season, PG&E will conduct a pre-construction nest survey in activity centers within 1 mile of the Scott Dam construction areas (including helicopter flight paths) to determine the location of any northern spotted owl nests. Nest surveys would follow the *Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls* (USFWS 2012). • Following completion of pre-construction nest surveys, PG&E will complete analysis to determine the nest location and timing in relation to proposed construction activities (e.g., blasting, helicopter flight paths, heavy equipment use) and the no-disturbance buffers established by USFWS in *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (USFWS 2006). USFWS guidelines specify the following no-disturbance buffers during the nesting season (February 1–July 9): – For blasting activities, the no-disturbance buffer is 1 mile. – For hauling on open roads, use of heavy equipment, rock crushing, and use of fixed-wing aircraft, the no-disturbance buffer is 0.25 mile. – For use of helicopters, the no-disturbance buffer is 0.5 mile (horizontal/vertical). • If nests are present and activities are proposed within the nesting season and no-disturbance buffer of Project recreation facilities and ancillary support facilities (not necessary for dam removal), PG&E would modify the timing of the activity or the flight paths to provide the no-disturbance buffer. • If nests are present and activities are proposed within the nesting season and no-disturbance buffer of Scott Dam removal (including ancillary facility removal necessary for dam removal), the following would be implemented, to the extent possible: – Modify the helicopter paths to provide no-disturbance buffer. – Modify timing of construction activities to take place outside the nesting season.

Protection, Mitigation, and Enhancement Measures
– If it is determined that Project activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with USFWS to obtain take authorization under the Endangered Species Act. • To the extent possible, any tree removal would be conducted outside the general avian nesting season (i.e., September 1–December 31).
Other Raptor Construction Measures
Osprey Measure • Pre-construction Nest Survey: – The year prior to the Initial Low-Flow Season and prior to each subsequent construction period, PG&E will implement pre-construction osprey nest surveys in conjunction with bald eagle surveys. Surveys will be completed consistent with the methods described in License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). • Nest Protection During Dam Removal: – To the extent possible, any tree removal would be conducted September 1–December 31, outside the general avian nesting season. – In the unlikely event an osprey nest is identified on a PG&E facility, PG&E will remove the nest prior to the osprey nesting season (i.e., September 1–March 14) to encourage nesting outside of the construction disturbance area. – In the unlikely event that a new nest is established within 300 feet of the dam construction areas during construction, PG&E will develop site-specific no-disturbance buffers to be maintained until a qualified biologist has determined that the nest is no longer active, consistent with PG&E's Avian Protection Plan. ▪ A qualified biologist with stop-work authority will be onsite initially when construction activities commence to monitor the behavior of the birds for signs of disturbance. The nature of construction activities and qualified biologist's observations of the bird's behavior will be considered to determine the level of monitoring needed during the construction period. • Nest Protection During Recreation Facility and Ancillary Facility Removal (not necessary for dam removal): – To the extent possible, any tree removal and recreation or ancillary facility removal would be conducted September 1–December 31, outside the general avian nesting season. – To the extent possible, recreation facility and ancillary facility removal will occur outside the general avian nesting season (i.e., September 1–December 31). – If construction must occur during the general avian nesting season, and if an active osprey nest is identified during pre-construction surveys within 300 feet of Project recreation facilities or other ancillary facilities to be removed as part of the Project, PG&E will establish a no-disturbance buffer during the nesting season (March 15–August 31) until a qualified biologist has determined that the nest is no longer active, consistent with PG&E's Avian Protection Plan. ▪ If a 300-foot buffer cannot be maintained, PG&E will develop a site-specific buffer that considers site topography, natural barriers, and the nature of the construction activity.

Protection, Mitigation, and Enhancement Measures
• Protect Active Osprey Nests During Removal of Project Powerlines/Communication Lines: – All Project powerlines will be removed as part of decommissioning. ▪ If an active osprey nest is identified on Project power or communication line pole, the pole will remain in place until the nest is no longer active, as determined by a qualified biologist. ▪ If the work must be conducted in a subsequent year, PG&E will remove the nest outside the osprey nesting season (i.e., September 1–March 14).
American Peregrine Falcon Measure • Pre-construction Nest Survey (Scott Dam Area): – Prior to the first year of construction and the peregrine falcon nesting season (February 15–July 31), PG&E will conduct a survey to identify and map cliff-nesting habitat within 500 feet of the construction areas in the Scott Dam Area. – If cliff-nesting habitat is present within 500 feet of construction areas, a pre-construction nest survey for peregrine falcon would be conducted prior to the first year of construction and during each subsequent construction period in all areas identified as containing suitable nesting habitat. One survey would be completed during the peregrine falcon nesting season (February 15–July 31) during each survey year. • Nest Protection During Scott Dam Removal: – To the extent possible, any tree removal would be conducted outside the general avian nesting season (i.e., September 1–December 31). – In the unlikely event an American peregrine falcon nest is located within 500 feet of the dam construction areas or on a PG&E facility, PG&E will install nest exclusion devices outside the peregrine falcon nesting season (i.e., August 1–February 14) and prior to the Initial Low-Flow Season to prevent nesting. • Nest Protection During Scott Dam Area Recreation Facility and Ancillary Facility Removal (not necessary for dam removal): – To the extent possible, any tree removal and recreation or ancillary facility removal would be conducted outside the general avian nesting season (i.e., September 1–December 31). – If an active American peregrine falcon nest is identified within 500 feet of Project recreation facilities or other ancillary facilities (located outside of the dam construction area) to be removed as part of the Project, PG&E will establish a 500-foot protective no-disturbance buffer that will be maintained until a qualified biologist has determined that the nest is no longer active, consistent with PG&E's Avian Protection Plan. ▪ If a 500-foot buffer cannot be maintained, PG&E will develop a site-specific buffer that considers site topography, natural barriers, and the nature of the construction activity.
Other Raptors Measure • A qualified biologist will conduct a survey for active raptor nests in the year prior to the Initial Low-Flow Season and prior to each subsequent construction period: – The survey area will include suitable habitat within 500 feet of construction areas and within 500 feet (horizontal/vertical) on either side of the helicopter flight paths. – Surveys may be conducted on foot (including using binoculars or spotting scopes from designated observation points), by helicopter, or using some combination thereof, as determined in consultation with resource agencies.

Protection, Mitigation, and Enhancement Measures
• Following completion of pre-construction nest surveys, PG&E will complete analysis to determine the nest location and timing in relation to proposed construction activities (e.g., blasting, helicopter flight paths, heavy equipment use) and species-specific protective buffers established in PG&E's Avian Protection Plan and/or agency regulations and policies: – If nests are present and activities are proposed within the nesting season and no-disturbance buffer of Project recreation facilities and ancillary support facilities (not necessary for dam removal), PG&E would modify the timing of the activity or the flight paths to provide the no-disturbance buffer. – If nests are present and activities are proposed within the nesting season and no-disturbance buffer of Scott Dam or Cape Horn Dam removal (including ancillary facility removal necessary for dam removal), the following would be implemented, to the extent possible: ▪ Modify the helicopter paths to provide no-disturbance buffer. ▪ Modify timing of construction activities to take place outside the nesting season. ▪ If it is determined that Project activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with resource agencies to develop a site-specific buffer that considers site topography, natural barriers, and the nature of the construction activity.
Other Special-status Birds and Game Birds Construction Measures
• Nest Protection During Vegetation Removal: – To the extent possible, conduct any vegetation clearing outside the general avian nesting season (i.e., September 1–February 14). – If vegetation removal must occur during the general nesting season (February 15–August 31), then a pre-construction nesting bird survey will be conducted prior to construction activities. A qualified biologist shall survey a 300-foot radius around the construction area. ▪ If no active nests are found, Project activities will proceed as planned. ▪ If an active nest is found, avoidance buffers will be implemented considering site-specific conditions such as level of disturbance proposed, ambient noise levels, existing acclimation to disturbance, nest concealment barriers, and species-specific natural history. • Nest Protection During Dam Removal: – The year prior to the nesting season, a qualified biologist will conduct a survey for nests (e.g., swallows, black phoebe, etc.) on the dams. – If nests are identified on PG&E facilities, the nests will be removed prior to the nesting season (September 1 to February 14) and exclusion devices (i.e., netting) would be established to prevent new nesting. – Any nest locations would be monitored regularly to prevent the establishment of new nests during the construction period. • Nest Protection During Recreation Facility and Other Ancillary Facility Removal: – To the extent possible, PG&E will conduct facility removal outside the general avian nesting season (i.e., September 1–February 14). – If facility removal outside the nesting season is not possible, a qualified biologist will conduct a survey for active nests (e.g., swallows, black phoebe, etc.) on structures to be removed (e.g., recreation facilities and other ancillary facilities) the year prior to construction. – If nests are identified, nests will be removed prior to the general avian nesting season (September 1 to February 14) and exclusion devices (e.g., netting) would be installed to prevent new nests from being established before the facility is removed.

Protection, Mitigation, and Enhancement Measures
Special-status Bats Construction Measures
• Roost Protection During Recreation Facility and Ancillary Facility Removal: – Decontamination Protocol ▪ When working in structures or tunnels where bats are known to occur, PG&E will implement the most recent version of the National White-Nose Syndrome Decontamination Protocol (White-Nose Syndrome Disease Management Working Group 2024). • Pre-construction Survey: – Prior to Initial Low-Flow Season activities, PG&E will conduct a pre-construction survey for bat roosts in all Project recreation facilities and ancillary facilities that were previously identified as supporting suitable bat roosting habitat (PG&E 2019a). ▪ To the extent possible, PG&E will implement removal of facilities that contain bat maternity roosts, outside the maternity roosting season (i.e., September 1 to April 30). o If the construction schedule requires the removal of the structure within the bat maternity roosting season (May 1 to August 31), then PG&E will install exclusion measures and deterrents (e.g., ultrasonic emitters, lights, fans, etc.) in the structure prior to April 15 to prevent bat occupancy. o If it is not practicable to delay the removal or install bat deterrents prior to the maternity season, PG&E will consult with resource agencies to determine the best methods to humanely evict bats. o For underground infrastructure that will be left in place or capped, PG&E will inspect the structures before capping or barricading for the presence of bats. If bats are present, PG&E will humanely evict all bats before capping or barricading. ▪ If a day roost is identified in a Project facility, PG&E will exclude individuals prior to removal of the facility.
Special-status Mesocarnivore Construction Measures
• PG&E will ensure contractors restrict vehicle speed limits within the construction area. – On unpaved roads, vehicles would be restricted to 25 miles per hour. • To the extent possible, removal of large trees and snags (>30-inch DBH hardwoods or >35-inch DBH conifers) would be conducted outside the denning season for fisher (i.e., July 1–February 28).
Special-status Plant Construction Measures
• Pre-construction Survey: – In the year prior to construction, a special-status plant survey will be conducted within a 100-foot buffer of the construction areas consistent with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). Invasive weed surveys will be conducted concurrently with the special-status plant surveys. – For the purposes of this work, a special-status plant is defined as species listed, proposed, or under review as rare, threatened, or endangered by the federal or state government; those designated by USFS as sensitive or watch list species within the Mendocino National Forest; and/or those on the CDFW Special Vascular Plants, Bryophytes, and Lichens List with a California Rare Plant Rank (CRPR) of 1 or 2.

Protection, Mitigation, and Enhancement Measures
• Special-status Plant Protection: – If special-status plant populations are found, PG&E will flag populations with a species-specific buffer prior to each year of ground-disturbing construction activities and/or implement site-specific measures considering the life history of the special-status plant species. – If avoidance of special-status plants is not practicable, PG&E will implement site-specific measures in consideration of species-specific life history traits. Examples may include the following: ▪ For annual plants, work would be conducted following seed set and senescence. ▪ For perennial plants, work would be conducted during the dormant season.
Invasive Weed Construction Measures
• Pre-Construction Surveys: – For the purposes of this work, invasive weeds are those rated by the California Department of Food and Agriculture as A, B, or on the CCR 4500 Noxious Weed List and those listed by the Mendocino National Forest Priority Ranking. Invasive weeds listed by Mendocino National Forest will only be addressed on Mendocino National Forest lands. • Prevent the Spread or Introduction of Invasive Weeds: – To prevent the spread or introduction of invasive weeds during construction, PG&E will implement the following measures: ▪ Off-road equipment that is not local to the Eel River Watershed will be cleaned to ensure that it is free of soil and plant parts before arriving in the construction area. ▪ Minimize soil disturbance to the extent possible. ▪ Drive and park on established roads as much as possible. ▪ Maintain gravel and soil spoil piles free of invasive weeds; use areas known to be weed-free for staging and laydown areas. ▪ If removal of invasive weed materials from an infested site is necessary, properly contain and transport the materials to a landfill. ▪ Materials used for erosion control will be certified weed-free (i.e., straw wattles, gravel, fill material, etc.). When restoring a site after disturbance, use a native seed mix. ▪ Topsoil stockpiles that will remain in place for longer than one month will be seeded with a native seed mix. ▪ Clean clothing, footwear, and gear before moving from an infested area to a non-infested area. ▪ Avoid working in invasive weed–infested areas or prioritize activities so that infested areas are worked last.
Riparian and Wetland Protection Measures
• Riparian vegetation removal will be limited to the extent possible. Riparian vegetation within the construction areas and directly adjacent to construction areas that will not be removed as part of construction will be flagged for avoidance prior to construction. • PG&E will obtain a Clean Water Act Section 404/401 permit/certification for construction and restoration activities and will implement all the conditions of the permits (including all riparian protection measures) as part of the Proposed Action. • PG&E will implement best management practices (BMPs) for work within and near aquatic habitats: – No vehicles or equipment will be refueled within 100 feet of wetlands, streams, or other waterways. Vehicles operating adjacent to wetlands and waterways will be inspected and maintained daily to prevent leaks.

Protection, Mitigation, and Enhancement Measures
– Mobile equipment will not be parked overnight within 100 feet of aquatic habitat. Stationary equipment (e.g., pumps and generators) used or stored within 100 feet of aquatic habitat will be positioned over secondary containment. – Keep spill kits onsite and clean up and report all hazardous spills immediately. – Protect waterways and storm drains with silt fence, fiber rolls, erosion control blankets, and other stormwater BMPs as necessary. – Erosion control materials shall be installed per manufacturing material specifications and must not contain monofilament netting.
Construction Aquatic Species Management and Monitoring Plan
PG&E will develop a Construction Aquatics Species Management and Monitoring Plan. Goal: Define measures to avoid or reduce potential impacts to aquatic species during construction • Pre-construction surveys by qualified aquatic biologists • Periodic surveys during construction by qualified aquatic biologists • Develop Fish Rescue and Relocation Plan for the removal/relocation of aquatic species prior to construction by qualified aquatic biologists • Environmental training for construction workers • Inadvertent discovery procedures for workers
Estuary Protection Plan
PG&E will develop an Estuary Protection Plan. Goal: Define measures to avoid or reduce potential impacts to the estuary during and after dam removal • Water quality monitoring in the estuary prior to, during, and after dam removal • Monitor for potential sedimentation in the estuary • Define a process for developing additional measures, if needed
Construction Non-native Invasive Aquatic Species Management Plan
PG&E will develop a Construction Non-native Invasive Aquatic Species Management Plan. Goal: Define measures to help minimize potential spread of invasive and non-native species during construction and with removal of the dams
Construction Aquatic Species Management and Monitoring Plan
PG&E will develop a Construction Aquatics Species Management and Monitoring Plan. Goal: Define measures to avoid or reduce potential impacts to aquatic species during construction in the Eel River and East Branch Russian River • Pre-construction surveys by qualified aquatic biologists • Periodic surveys during construction by qualified aquatic biologists • Removal/relocation of aquatic species by qualified aquatic biologists • Environmental training for construction workers • Inadvertent discovery procedures for workers

Protection, Mitigation, and Enhancement Measures
Sediment/Channel Monitoring and Response Plan
PG&E will develop a Sediment/Channel Monitoring and Response Plan. Goal: Define measures to reduce potential impacts of sediment during and after removal of the dams in the Eel River • The plan will include sediment and channel response measures during drawdown and after dam removal, including the following: – Monitoring of potential sediment deposition and reductions of flow conveyance at bridge locations that may occur from notching Scott Dam; – Monitoring potential scour at bridges during high flows that may occur from notching Scott Dam; – Monitoring water intakes or diversions downstream of the dams that could become inoperable during Lake Pillsbury drawdown and after notching Scott Dam; – Maintain mainstem and tributary fish passage, including at critical riffles, tributary confluences, and the dam sites; and – Address floodplain sediment deposition after dam removal.
Cultural and Tribal Resources
PG&E will develop a Memorandum of Agreement (Known Historic Properties). PG&E will develop a Programmatic Agreement and Historic Properties Management Plan (HPMP).
Land Use Measures
• PG&E will develop a Post-construction Road Restoration Plan that will define measures for repairing or restoring roadways located within the FERC Project boundary to pre-construction conditions or better. • PG&E will adhere to measures contained in county and/or California Department of Transportation road use permits. • PG&E will implement BMPs to limit work areas to minimize disturbance and limit locations of staging and access to developed routes and previously disturbed areas to the extent possible.
Fire Prevention and Suppression Measures
Construction Fire Plan
PG&E will develop a Construction Fire Plan. Goal: Outline strategies for fire prevention, detection, and response, ensuring that all personnel are trained and equipped to handle potential fire hazards effectively during construction, including restoration activities. This plan will be consistent with PG&E's utility fire standard.

Protection, Mitigation, and Enhancement Measures
Hazardous Materials Measures
• PG&E will develop a Spill Prevention, Control, and Countermeasures Plan prior to construction that will define measures to prevent spills of pollutants and define response procedures in the event of a spill. • PG&E will comply with all required applicable local, state, and federal standards associated with handling and disposal of hazardous materials. • PG&E will install sanitary facilities during construction. • PG&E will implement construction-related BMPs designed to control and contain spills to minimize the potential for soil contamination.
Scott Dam Slope Stability Monitoring Plan
PG&E will develop a Scott Dam Slope Stability Monitoring Plan. Goal: Identify measures to address and reduce the potential for reactivating the landslide upstream of Scott Dam
Public Safety Measures
PG&E will develop a Public Safety Plan. Goal: Identify potential public and worker safety risks and measures to be implemented during construction and removal of the dams, recreation facilities, and ancillary features to protect the public and workers during construction Goal: Develop public outreach and communications regarding the schedule and timing of construction activities and dam removal
Construction Recreation Plan
PG&E will develop a Construction Recreation Plan. Goal: Identify measures to inform recreationists about the Project construction schedule and closure areas Measures will include the following: • Public notification measures that will include announcement and posting Project construction schedule and closure areas • Signage that informs recreationists about Project activities • Safety during construction would be addressed in the Public Safety Plan
Water Quality and Erosion Control Measures
• PG&E will develop a Stormwater Pollution Prevention Plan prior to construction. • PG&E will implement construction-related BMPs to control erosion. • PG&E will obtain and implement resource agency and construction permits, following water quality BMPs and complying with local, state, and federal laws, as required: – United States Army Corps of Engineers Section 404 Clean Water Act Permit; – State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification; and – State Water Resources Control Board Construction General Permit/Stormwater Pollution Prevention Plan.

Protection, Mitigation, and Enhancement Measures
Construction Erosion Prevention Plan
PG&E will develop a Construction Erosion Prevention Plan. Goal: Define measures to avoid or reduce potential for soil erosion during construction • The plan will include the following: – Establishment of preventative measures to divert surface runoff around bare areas; – Construction of drainage facilities to control erosion and/or sedimentation during earthwork; – Identification of measures to prevent or minimize erosion, including vegetative or mechanical measures to improve surface soil stability; and – Revegetation of unstable or disturbed soil surfaces as soon as possible to reduce erosion potential.
Construction Site Water Diversion, Dewatering, and Drawdown Plan
PG&E will develop a Construction Site Water Diversion, Dewatering, and Drawdown Plan for Scott Dam and Cape Horn Dam. Goal: Define measures to avoid or reduce potential impacts to hydrology during construction • The plan will include the following: – Flow releases (magnitude and timing) during Lake Pillsbury drawdown and deconstruction; – Timing of dam deconstruction pulse flow release (rapid removal); – Construction minimum instream flows in the Eel River; – Measures to ensure the minimum instream flows are met; – Measures to manage water temperatures below Scot Dam for fish during drawdown; – Coordination with East Branch Russian River diversions; – Identification of avoidance drawdown flows (magnitude and timing) that could adversely affect environmental resources, including minimizing unwanted downstream fish attraction flows that would draw Chinook salmon past Tomki Creek; and – Safety measures for the low-level outlet spring below Scott Dam.
Construction Water Quality and Water Temperature Monitoring Plan
PG&E will develop a Construction Water Quality and Water Temperature Monitoring Plan. Goal: Define measures to assess and mitigate potential impacts to water quality and water temperature of nearby water bodies during construction activities associated with the Surrender Application.
East Branch Russian River Diversion Plan
PG&E will develop an East Branch Russian River Diversion Plan. Goal: Define measures to provide pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction and coordination with the Eel-Russian Project Authority (ERPA)-related for the NERF construction to ensure construction plans do not interfere with diversions to the East Branch Russian River.

Table 2-15. Avoidance and protection measures and best management practices to address and reduce potential effects to environmental and cultural resources during NERF construction.

Protection, Mitigation, and Enhancement Measures
General Construction Measures
All contractors and staff will be made aware of the ecological and cultural resource values of each site and will be given instructions to comply with site-specific avoidance and protection measures and BMPs.
Construction activities will be limited to a designated work area (including the work corridor and staging area). The work area will be clearly identified on the construction drawings and shall be staked and flagged where necessary prior to initiation of construction activities.
Construction activities will be implemented 10 hours per day, beginning after sunrise (but no earlier than 7:00 a.m.), and ending before sunset (but no later than 7:00 p.m.), Monday through Saturday.
Biological Resources
General Wildlife Measures
To avoid the entrapment of small animals (e.g., amphibians or small mammals), ERPA will: • Cover open excavations at the end of each workday or install escape ramps. • Inspect open excavations prior to the initiation of each workday. • If any animal is found entrapped in an excavation and cannot leave of its own accord (e.g., using escape ramps or other passive methods), workers will follow the protocol for previously undiscovered species. • Animals will not be handled except by appropriately permitted individuals.
Protocol for previously undiscovered species: • Observations of special-status species will be reported to the ERPA Environmental Resources Manager as soon as practicable. • All activities that have the potential to result in harassment, injury, or death of any animal will cease until the animal moves out of harm’s way on its own accord. • Work may resume after the animal moves out of harm’s way. • Animals will not be handled except by appropriately permitted individuals.

Protection, Mitigation, and Enhancement Measures

Bald Eagle Conservation Plan

- ERPA will develop a Bald Eagle Conservation Plan.

Goal: Define Measures to Protect Bald Eagles During Construction Activities

- Pre-construction nest survey
  - To the extent possible, trees 24” DBH or greater would be removed outside the general avian nesting season (i.e., September 1–December 31).
  - The year prior to construction and prior to each subsequent construction period, ERPA will implement pre-construction bald eagle surveys consistent with the methods described in License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004).
  - ERPA will submit Nest Survey forms to USFS and CDFW raptor coordinator consistent with the reporting requirements under License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). Survey forms will also be submitted to U.S. Fish and Wildlife Service (USFWS).
- Following completion of pre-construction nest surveys, ERPA will complete analysis to determine the nest location and timing in relation to proposed construction activities (e.g., blasting, helicopter flight paths, heavy equipment use) and the National Bald Eagle Management Guidelines nest protection no-disturbance buffers (USFWS 2007). USFWS guidelines specify the following no-disturbance buffers:
  - A 660-ft. no-disturbance buffer for use of heavy equipment and general construction activities; and
  - A 1,000-ft. no-disturbance buffer for helicopters and fixed-wing aircraft.
- If active nests are present within the USFWS-recommended no-disturbance buffer for the new pump station construction area, the following would be implemented during the nesting season (January 1–August 31), to the extent possible:
  - Modify the helicopter paths to provide the no-disturbance buffer.
  - Modify timing of construction activities to take place outside the nesting season (i.e., September 1 – December 31).
  - If it is determined that construction activities cannot be modified (timing/location) to provide the no-disturbance buffer, ERPA will consult with USFWS to obtain take authorization under the Bald and Golden Eagle Protection Act.

Other Raptor Construction Measures

Osprey Measure

- Pre-construction nest survey:
  - Prior to the initiation of the construction period, ERPA will implement pre-construction osprey nest surveys in conjunction with bald eagle surveys.
- Nest protection during construction:
  - Tree removal would be conducted September 1–December 31, outside the general avian nesting season.
  - In the unlikely event that a new nest is established within 300 ft. of the construction areas during construction, ERPA will develop site-specific no-disturbance buffers to be maintained until a qualified biologist has determined that the nest is no longer active, consistent with PG&E’s Avian Protection Plan.
  - A qualified biologist with stop work authority will be on-site initially when construction activities commence to monitor the behavior of the birds for signs of disturbance. The nature of construction activities and qualified biologist’s observations of the bird’s behavior will be considered to determine the level of monitoring needed during the construction period.

Protection, Mitigation, and Enhancement Measures
Other Raptors Measure • Nest protection during vegetation removal: – Tree removal would be conducted outside the general avian nesting season (i.e., September 1–December 31). • A qualified biologist will conduct a survey for active raptor nests in the year prior to initiation of each construction season. – The survey area will include suitable habitat within 500 ft. of the new pump station construction area and within 500 ft. (horizontal/vertical) on either side of the helicopter flight paths. – Surveys may be conducted on foot (including using binoculars or spotting scopes from designated observation points), by helicopter, or using some combination thereof, as determined in consultation with resource agencies. • Following completion of pre-construction nest surveys, ERPA will complete analysis to determine the nest location and timing in relation to proposed construction activities (e.g., helicopter flight paths, heavy equipment use) and species-specific protective buffers established in PG&E's Avian Protection Plan and/or agency regulations and policies. – If nests are present and activities are proposed within the nesting season and no-disturbance buffer, the following would be implemented, to the extent possible: – Modify the helicopter paths to provide the no-disturbance buffer. – Modify timing of construction activities to take place outside of the nesting season. – If it is determined that project activities cannot be modified (timing/location) to provide the no-disturbance buffer, ERPA will consult with resource agencies to develop a site-specific buffer that considers site topography, natural barriers, and the nature of the construction activity.
Other Special-status Birds and Game Birds Construction Measures
• Nest protection during vegetation removal: – Vegetation removal will be conducted outside the general avian nesting season (i.e., September 1–December 31). • Nest protection during construction: – A pre-construction nesting bird survey will be conducted within a 300-ft. buffer of the new pump station construction area and on Potter Valley Powerhouse structures that will be affected by construction. Surveys would be conducted during the nesting season (March 1 – August 31). – If an active nest is found, avoidance buffers will be implemented, considering site-specific conditions such as level of disturbance proposed, ambient noise levels, existing acclimation to disturbance, nest concealment barriers, and species-specific natural history. – If no active nests are found, project activities will proceed as planned.
Mesocarnivore Construction Measures
ERPA will ensure contractors restrict vehicle speed limits within the construction area. • On unpaved roads, vehicles would be restricted to 25 miles per hour.

Protection, Mitigation, and Enhancement Measures
Special-Status Plant Construction Measures
• Pre-construction survey: – In the year prior to construction, a special-status plant survey will be conducted within a 100-ft. buffer of the new pump station construction area, consistent with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). Invasive weed surveys will be conducted concurrently with the special-status plant surveys. – For the purposes of this work, a special-status plant is defined as species listed, proposed, or under review as rare, threatened, or endangered by the federal or state government; those designated by USFS as sensitive or watch list species within the Mendocino National Forest; and/or those on the CDFW Special Vascular Plants, Bryophytes, and Lichens List with a California Rare Plant Rank of 1 or 2. • Special-status plant protection: – If special-status plant populations are found, ERPA will flag populations with a 25-ft. buffer prior to construction activities and/or implement site-specific measures considering the life history of the special-status plant species. • If avoidance of special-status plants is not practicable, ERPA will implement site-specific measures in consideration of species-specific life history traits. Examples may include: – For annual plants, work would be conducted following seed set and senescence. – For perennial plants, work would be conducted during the dormant season. – If a special-status plant becomes established within the riparian area that will be permanently filled to allow for construction of the new pump station, ERPA will consult with resource agencies to determine, based on species present, options for seed collection or transplanting individuals to an area approved by resource agencies.
Invasive Weed Construction Measures
• Pre-construction surveys: – Conduct invasive weed surveys in conjunction with special-status plant surveys (described above). – For the purposes of this work, invasive weeds are those rated by the California Department of Food and Agriculture as A, B, or on the California Code of Regulations 4500 Noxious Weed List. • Prevent the spread or introduction of invasive weeds: – To prevent the spread or introduction of invasive weeds during construction, ERPA will implement the following measures: – Off-road equipment that is not local to the Eel River Watershed will be cleaned to ensure that it is free of soil and plant parts before arriving in the construction area. – Minimize soil disturbance to the extent possible. – Drive and park on established roads as much as possible. – Maintain gravel and soil spoil piles free of invasive weeds; use areas known to be weed-free for staging and laydown areas. – If removal of invasive weed materials from an infested site is necessary, properly contain and transport the materials to a landfill.

Protection, Mitigation, and Enhancement Measures
– Materials used for erosion control will be certified weed free (e.g., straw wattles, gravel, fill material). When restoring a site after disturbance, use a native seed mix. – Topsoil stockpiles that will remain in place for longer than 1 month will be seeded with a native seed mix. – Clean clothing, footwear, and gear before moving from an infested area to a non-infested area. – Avoid working in invasive weed–infested areas or prioritize activities so that infested areas are worked last.
Riparian and Wetland Protection Measures
• A total of 0.09 acre of riparian vegetation (e.g., forested wetland as classified by Stillwater Sciences [PG&E 2019]) will be removed for construction of the new pump station. All other riparian vegetation within the construction areas and directly adjacent to construction areas will be flagged for avoidance prior to construction. • ERPA will obtain a Clean Water Act Section 404/401 permit/certification and implement all the conditions of the permits (including all riparian protection and mitigation measures) as part of the proposed action.
• ERPA will implement BMPs for work within and near aquatic habitats: – No vehicles or equipment will be refueled within 100 ft. of wetlands, streams, or other waterways. Vehicles operating adjacent to wetlands and waterways will be inspected and maintained daily to prevent leaks. – Mobile equipment will not be parked overnight within 100 ft. of aquatic habitat. Stationary equipment (e.g., pumps and generators) used or stored within 100 ft. of aquatic habitat will be positioned over secondary containment. – Keep spill kits onsite and clean up and report all hazardous spills immediately. – Protect waterways and storm drains with silt fence, fiber rolls, erosion control blankets, and other Storm Water BMPs as necessary. – Erosion control materials shall be installed per manufacturing material specifications and must not contain monofilament netting.
Construction Aquatic Species Management and Monitoring Plan
ERPA will develop a Construction Aquatics Species Management and Monitoring Plan. • Goal: Define measures to avoid or reduce potential impacts to aquatic species during construction. ▪ Pre-construction surveys by qualified aquatic biologists ▪ Periodic surveys during construction by qualified aquatic biologists ▪ Removal/relocation of aquatic species by qualified aquatic biologists ▪ Environmental training for construction workers ▪ Inadvertent discovery procedures for workers
Cultural and Tribal Resources
ERPA will develop a Memorandum of Agreement (Known Historic Properties)
ERPA will develop a Programmatic Agreement and Historic Properties Management Plan (HPMP)

Protection, Mitigation, and Enhancement Measures
Land Use Measures
• ERPA will repair or restore roadways located within the FERC Project boundary to pre-construction conditions or better. • ERPA will adhere to measures contained in county and/or California Department of Transportation road use permits. • ERPA will implement BMPs to limit work areas to minimize disturbance and limit locations of staging and access to developed routes and previously disturbed areas to the extent possible.
Fire Prevention and Suppression Measures
Construction Fire Plan
ERPA will develop a Construction Fire Plan. Goal: Outline strategies for fire prevention, detection, and response, ensuring that all personnel are trained and equipped to handle potential fire hazards effectively. This plan will be consistent with PG&E's utility fire standard.
Hazardous Materials Measures
• ERPA will develop a Spill Prevention, Control, and Countermeasure Plan prior to construction that will define measures to prevent spills of pollutants and define response procedures in the event of a spill. • ERPA will comply with all required applicable local, state, and federal standards associated with handling and disposal of hazardous materials. • ERPA will install sanitary facilities during construction. • ERPA will implement construction-related BMPs designed to control and contain spills to minimize the potential for soil contamination.
Water Quality and Erosion Control Measures
• ERPA will develop a Stormwater Pollution Prevention Plan prior to construction. • ERPA will implement construction-related BMPs to control erosion. • ERPA will obtain and implement resource agency and construction permits, following water quality BMPs and complying with local, state, and federal laws (e.g., Basin Plan water quality requirements): – United States Army Corps of Engineers Section 404 Clean Water Act Permit; – State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification; and – State Water Resources Control Board Construction General Permit/Stormwater Pollution Prevention Plan.
Construction Site Dewatering Plan
ERPA will develop a Construction Site Dewatering Plan. Goal: Define measures to avoid or reduce potential impacts to hydrology during construction.

Protection, Mitigation, and Enhancement Measures
Construction Water Quality Monitoring Plan
ERPA will develop a Construction Water Quality Monitoring Plan. Goal: Define measures to assess and mitigate potential impacts to water quality of nearby waterbodies during construction activities associated with construction of the NERF.
Construction East Branch Russian River Diversion Plan
ERPA will develop an East Branch Russian River Diversion Plan. Goal: Define measures for the coordination of NERF construction activities with PG&E's East Branch Russian River Diversion Plan.
Erosion Prevention Plan
ERPA will develop an Erosion Prevention Plan. Goal: Define measures to reduce potential soil erosion and runoff during construction activities associated with construction of the NERF.

Table 2-16. Avoidance and protection measures and best management practices to address and reduce potential effects to environmental and cultural resources during Phase 2.

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
General Restoration[1] Measures		
All contractors and staff will be made aware of the ecological and cultural resource values of each site and will be given instructions to comply with site-specific avoidance and protection measures and BMPs.	X	X
Restoration activities will be limited to a designated work area (including the work corridor and staging area). The work area will be clearly identified on the restoration design drawings and shall be staked and flagged where necessary prior to initiation of restoration activities.	X	X
Restoration activities will be implemented 10 hours per day, beginning after sunrise (but no earlier than 7:00 a.m.) and ending before sunset (but no later than 7:00 p.m.), Monday through Saturday.	X	X
PG&E will implement emission reduction measures during restoration, such as the following: • Clean construction vehicles leaving the site to prevent dust, silt, mud, and dirt from being released or tracked offsite. • Dry mechanical sweeping and use of blower devices are prohibited. All visible trackout material from vehicles leaving the work site shall be removed from paved, public streets using wet sweeping or a high-efficiency particulate air filter equipped vacuum device. • Suspend grading and earthmoving operations if wind speeds are high enough to result in dust emissions crossing the construction work area boundary despite the application of dust mitigation measures. • Prevent dust emissions from materials hauled offsite by adequately wetting all loads and either covering completely with tarps or ensuring at least 6 inches of freeboard on the front, back, or sides of the cargo compartment and that no point of the load extends above the top of the cargo compartment. • Depending on equipment availability, require that all diesel construction engines with a rating of 50 horsepower or greater meet, at a minimum, the Tier 4 California emission standards for off-road engines (13 CCR 2423[b][1][B]). • Consistent with the California Air Resources Board's In-Use Off-Road Diesel-Fueled Fleets Regulation, require contractors to limit idling of construction vehicles and equipment onsite to 5 minutes or less unless idling is necessary for effective work progress or equipment operation. • Require contractors to maintain construction equipment in proper working order and in accordance with manufacturer specifications.	X	X

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
PG&E will implement air quality measures to address and reduce potential fugitive dust emissions during restoration: • Stabilize unpaved areas subject to vehicle traffic by watering, treating with a non-toxic chemical dust suppressant, or covering. • Stabilize storage piles and disturbed areas not subject to vehicular traffic by keeping wet, treating with a non-toxic chemical dust suppressant, or covering when material is not being added to, or removed from, the pile. • Prior to any ground disturbance, including grading, excavating, and land clearing, apply sufficient water to the area to be disturbed to limit dust and minimize emissions. • Clean construction vehicles leaving the site to prevent dust, silt, mud, and dirt from being released or tracked offsite. • Dry mechanical sweeping and use of blower devices are prohibited. All visible trackout material from vehicles leaving the work site shall be removed from paved, public streets using wet sweeping or a high-efficiency particulate air filter equipped vacuum device. • Suspend grading and earthmoving operations if wind speeds are high enough to result in dust emissions crossing the construction work area boundary despite the application of dust mitigation measures. • Prevent dust emissions from materials hauled offsite by adequately wetting all loads and either covering completely with tarps or ensuring at least 6 inches of freeboard on the front, back, or sides of the cargo compartment and that no point of the load extends above the top of the cargo compartment.	X	X
PG&E will develop a Transportation Management Plan to be implemented during restoration. • Harden heavily used parking area surfaces. • The plan shall include, but is not limited to, the following items: – Guidance on the number and size of trucks per day entering and leaving the Project site; – Identification of arrival/departure times that would minimize traffic impacts. Staff shall commute during off-peak hours; – Approved truck circulation patterns and haul routes; – Locations of staging areas; – Locations of employee parking; – All construction employees shall park in designated lots owned by the Project applicant or on private lots otherwise arranged for by the Project applicant; – Methods for partial/complete street closures (e.g., timing, signage, location, and duration restrictions); – Criteria for use of flaggers and other traffic controls; – Preservation of safe and convenient passage for bicyclists and pedestrians through/around construction areas, as applicable. Roadways, unmarked crosswalks, and bicycle facilities (e.g., roadway shoulders that could be used by bicyclists) shall be maintained clear of debris (e.g., rocks) that could otherwise impede travel and impact public safety; – Monitoring for roadbed damage and timing for completing repairs; – Preservation of emergency vehicle access;	X	X

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
– Removing traffic obstructions during emergency evacuation events; – Public notification regarding planned road use by haul trucks and workers, including dates and times of construction activities; and – Providing a point of contact for residents to obtain construction information, have questions answered, and convey complaints.		
Biological Resources		
General Wildlife Restoration Measures		
• To avoid entrapment of small animals (e.g., amphibians or small mammals) during restoration activities, PG&E will do the following: – Cover open excavations at the end of each workday or install escape ramps. – Inspect open excavations prior to the initiation of each workday. – If any animal is found entrapped in an excavation and cannot leave of its own accord (e.g., using escape ramps or other passive methods), workers will follow the protocol for previously undiscovered species. – Animals will not be handled except by appropriately permitted individuals.	X	
• Protocol for previously undiscovered species: – Observations of special-status species will be reported to the PG&E Environmental Resources Manager as soon as practicable. – All activities that have the potential to result in harassment, injury, or death of any animal will cease until the animal moves out of harm's way on its own accord. – Work may resume after the animal moves out of harm's way. – Animals will not be handled except by appropriately permitted individuals.	X	X
Wildlife Stranding Measure		
PG&E will develop a Wildlife Stranding Measure in consultation with resources agencies that will be implemented as part of the Proposed Action. Specific goals of the measures include the following: • Goal: Minimize Wildlife Stranding in Reservoir Beds Following Reservoir Drawdown and Dam Removal • Goal: Identify and Install Wildlife Deterrents and/or Protective Barriers	X	

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
Bald Eagle Restoration Plan		
PG&E will develop a Bald Eagle Conservation Plan. • Goal: Define Measures to Protect Bald Eagles During Restoration Activities – Nest Survey: ▪ Each year, prior to use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring and Response Plan, PG&E will implement a bald eagle survey consistent with the methods described in License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). ▪ PG&E will submit Nest Survey Forms to the USFS and CDFW raptor coordinator consistent with the reporting requirements under License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). Survey forms will also be submitted to USFWS. – Following completion of the nest surveys, PG&E will complete analysis to determine the nest location and timing in relation to proposed activities (e.g., helicopter use, heavy equipment use) and the National Bald Eagle Management Guidelines nest protection no-disturbance buffers (USFWS 2007). USFWS guidelines specify the following no-disturbance buffers: ▪ A 660-foot no-disturbance buffer for use of heavy equipment and general construction activities; and ▪ A 1,000-foot no-disturbance buffer (horizontal/vertical) for helicopters and fixed-wing aircraft. – If active nests are present within the USFWS-recommended no-disturbance buffer of activities requiring the use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan, PG&E would implement the following: ▪ Modify the timing/location of the activity to provide the no-disturbance buffer, if possible. ▪ If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with USFWS to develop site-specific measures that consider the type of restoration activity and the specific location of the nest (topography, slope, etc.).	X	
Northern Spotted Owl Measures		
PG&E will develop a Northern Spotted Owl Management Plan. • Goal: Define Appropriate Measures to Protect Northern Spotted Owl During Restoration Activities in Scott Dam Area – Nest Protection: ▪ Each year prior to the use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan, PG&E will conduct a nest survey in activity centers within 1 mile of the proposed activity (including helicopter flight paths) to determine the location of any northern spotted owl nests. Nest surveys would follow the *Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls* (USFWS 2012).	X	

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
▪ Following completion of nest surveys, PG&E will complete analysis to determine the nest location and timing in relation to proposed activities (e.g., helicopter flight paths, heavy equipment use) and the no-disturbance buffers established by USFWS in *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (USFWS 2006). USFWS guidelines specify the following no-disturbance buffers during the nesting season (February 1–July 9): o For hauling on open roads, use of heavy equipment, rock crushing, and use of fixed-wing aircraft, the no-disturbance buffer is 0.25 mile. o For use of helicopters, the no-disturbance buffer is 0.5 mile (horizontal/vertical). ▪ If active nests are present within the USFWS-recommended no-disturbance buffer of activities requiring the use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan, PG&E would implement the following: o Modify the timing/location of the activity to provide the no-disturbance buffer, if possible. o If it is determined that activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with USFWS to obtain take authorization under the Endangered Species Act.		
Other Raptor Restoration Measures		
Osprey Measure • Pre-construction Nest Survey: – Each year prior to the use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan, PG&E will implement osprey nest surveys in conjunction with bald eagle surveys. Surveys will be completed consistent with the methods described in License Article 54 – Bald Eagle Monitoring Plan (PG&E 2004). Searches for osprey nests will be conducted concurrently with bald eagle surveys. • Nest Protection During Restoration: – If use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan must occur during the general avian nesting season, and if an active osprey nest is identified during pre-construction surveys within 300 feet of the proposed activity, PG&E will implement the following: ▪ Modify the timing/location of the activity to provide the no-disturbance buffer, if possible. ▪ If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer for osprey (i.e., 300 feet), a qualified biologist with stop-work authority will be onsite when restoration activities commence to monitor the behavior of ospreys and to determine the level of monitoring that would be needed during the restoration period.	X	

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
American Peregrine Falcon Measure • Nest Survey (Scott Dam Area): – If cliff-nesting habitat is present within 500 feet of proposed use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan in the Scott Dam Area, a nest survey for peregrine falcon would be conducted in suitable habitat prior to implementation of activities. • Nest Protection Restoration Activities (Scott Dam Area): – If an active American peregrine falcon nest is identified within 500 feet of proposed use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan in the Scott Dam Area, PG&E will implement the following: ▪ Modify the timing/location of the activity to provide the no-disturbance buffer, if possible. ▪ If it is determined that activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with resource agencies to develop a site-specific buffer that considers site topography, natural barriers, and the nature of the activity.	X	
Other Raptors Measure • A qualified biologist will conduct a survey for active raptor nests in the year prior to the use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan: – The survey area will include suitable habitat within 500 feet of proposed activities and within 500 feet on either side of any helicopter flight paths. – Surveys may be conducted on foot (including using binoculars or spotting scopes from designated observation points), by helicopter, or using some combination thereof, as determined in consultation with resource agencies. – If an active nest is identified within 500 feet of proposed use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan, PG&E will implement the following: ▪ Modify the timing/location of the activity to provide the no-disturbance buffer, if possible. ▪ If it is determined that activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with resource agencies to develop a site-specific buffer that considers site topography, natural barriers, and the nature of the activity.	X	
Other Special-status Birds and Game Birds Restoration Measures		
• Nest Protection During Plant Material Collection: – To the extent possible, plant material to support restoration activities will be collected outside the general avian nesting season (i.e., September 1–February 14). – If plant material must be collected during the general nesting season (February 15–August 31), then a nesting bird survey will be conducted prior to plant material collection.	X	

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
▪ If no active nests are found, plant collection activities will proceed as planned. ▪ If an active nest is found, avoidance buffers will be implemented and, if necessary, an alternative collection site will be identified.		
Special-status Mesocarnivore Restoration Measures		
• PG&E will ensure contractors restrict vehicle speed limits within the restoration area. – On unpaved roads, vehicles would be restricted to 25 miles per hour.	X	
Tule Elk and Game Mammals Measures		
• PG&E will develop a Tule Elk Management Plan. • Goal: Develop Elk Exclusion Methods to Limit Elk Browsing Within Restoration Areas	X	
• Goal: Conduct Monitoring and Reporting to Document Tule Elk Habitat Use in the Scott Dam Area Post-construction and during Restoration	X	X
Special-Status Plant Restoration Measures		
• Special-status Plant Protection: – If special-status plant populations are found, PG&E will flag populations with a species-specific buffer prior to each year of ground-disturbing restoration activities and/or implement site-specific measures considering the life history of the special-status plant species. – If avoidance of special-status plants is not practicable, PG&E will implement site-specific measures in consideration of species-specific life history traits. Examples may include the following: ▪ For annual plants, work would be conducted following seed set and senescence. ▪ For perennial plants, work would be conducted during the dormant season.	X	

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
Invasive Weed Restoration Measures		
• Prevent the Spread or Introduction of Invasive Weeds: – To prevent the spread or introduction of invasive weeds during restoration, PG&E will implement the following measures: ▪ Off-road equipment that is not local to the Eel River Watershed will be cleaned to ensure that it is free of soil and plant parts before arriving in the construction area. ▪ Minimized soil disturbance to the extent possible. ▪ Drive and park on established roads to the extent possible. ▪ Maintain gravel and soil spoil piles free of invasive weeds; use areas known to be weed-free for staging and laydown areas. ▪ If removal of invasive weed materials from an infested site is necessary, properly contain and transport the materials to a landfill. ▪ Materials used for erosion control will be certified weed-free (i.e., straw wattles, gravel, fill material, etc.). When restoring a site after disturbance, use a native seed mix. ▪ Topsoil stockpiles that will remain in place for longer than one month will be seeded with a native seed mix. ▪ Clean clothing, footwear, and gear before moving from an infested area to a non-infested area. ▪ Avoid working in invasive weed–infested areas or prioritize activities so that infested areas are worked last.	X	X
Riparian and Wetland Protection Measures		
• Riparian or wetland vegetation within and adjacent to restoration areas will be flagged for avoidance prior to implementation of restoration activities. • PG&E will obtain a Clean Water Action Section 404/401 permit/certification and implement all the conditions of the permits (including all riparian protection measures) as part of the Project.	X	
Post-dam Removal Aquatic Species Management and Monitoring Plan		
PG&E will develop a Post-construction Aquatics Species Management and Monitoring Plan. • Goal: Define measures and a process for addressing mortality of aquatic species (e.g., Chinook salmon, steelhead, coho, sturgeon, foothill yellow-legged frog, western pond turtle, lamprey, and mussels) after dam removal.	X	X

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	Phase 2b
Estuary Protection Plan		
PG&E will develop an Estuary Protection Plan. Goal: Define measures to avoid or reduce potential impacts to the estuary during and after dam removal • Water quality monitoring in the estuary prior to, during, and after dam removal • Monitor for potential sedimentation in the estuary • Monitor potential effects to fish passage and holding habitats • Define a process for developing additional measures, if needed	X	X
Cultural and Tribal Resources		
PG&E will develop a Memorandum of Agreement (Known Historic Properties).	X	X
PG&E will develop a Programmatic Agreement and Historic Properties Management Plan (HPMP).	X	X
Land Use Measures		
• PG&E will develop a Post-construction Road Restoration Plan that will define measures for repairing or restoring roadways located within the FERC Project boundary to pre-construction conditions or better. • PG&E will adhere to measures contained in county and/or California Department of Transportation road use permits. • PG&E will implement BMPs to limit work areas to minimize disturbance and limit locations of staging and access to developed routes and previously disturbed areas to the extent possible.	X	
Fire Prevention and Suppression Measures		
Construction Fire Plan		
PG&E will develop a Construction Fire Plan. Goal: Outline strategies for fire prevention, detection, and response, ensuring that all personnel are trained and equipped to handle potential fire hazards effectively during construction, including restoration activities. This plan will be consistent with PG&E's utility fire standard.	X	X

<table>
<tr><th rowspan="2">Protection, Mitigation, and Enhancement Measures</th><th colspan="2">Surrender Application</th></tr>
<tr><th>Phase 2a</th><th>Phase 2b</th></tr>
<tr><td colspan="3">Hazardous Materials Restoration Measures</td></tr>
<tr><td>• PG&E will develop a Spill Prevention, Control, and Countermeasures Plan prior to restoration activities that will define measures to prevent spills of pollutants and define response procedures in the event of a spill.
• PG&E will comply with all required applicable local, state, and federal standards associated with handling and disposal of hazardous materials.
• PG&E will install sanitary facilities during restoration activities.
• PG&E will implement construction-related BMPs designed to control and contain spills to minimize the potential for soil contamination.</td><td>X</td><td>X</td></tr>
<tr><td colspan="3">Flood Monitoring Plan</td></tr>
<tr><td>PG&E will develop a Flood Monitoring Plan.
• The plan will establish protocols for monitoring water levels and flood risks, define measures to protect downstream infrastructure and surrounding areas, and define a process for addressing any potential issues.</td><td>X</td><td>X</td></tr>
<tr><td colspan="3">Sediment/Channel Monitoring and Response Plan</td></tr>
<tr><td>PG&E will develop a Sediment/Channel Monitoring and Response Plan.
Goal: Define measures to reduce potential impacts of sediment during and after removal of the dams in the Eel River
• The plan will include sediment and channel response during drawdown and after dam removal, including the following:
– Measures for monitoring of potential sediment deposition and reductions of flow conveyance at bridge locations that may occur from notching Scott Dam;
– Measures for monitoring potential scour at bridges during high flows that may occur from notching Scott Dam;
– Measures for monitoring water intakes or diversions downstream of the dams that could become inoperable during Lake Pillsbury drawdown and after notching Scott Dam;
– Measures to maintain mainstem and tributary fish passage, including at critical riffles, tributary confluences, and the dam sites; and
– Measures to manage floodplain sediment deposition after dam removal.</td><td>X</td><td>X</td></tr>
<tr><td colspan="3">Public Safety Measures</td></tr>
<tr><td>PG&E will develop a Public Safety Plan.
Goal: Identify potential public and worker safety risks and measures to be implemented during restoration and removal of the dams, recreation facilities, and ancillary features to protect the public and workers during restoration.
Goal: Develop public outreach and communications regarding the schedule and timing of construction and restoration activities.</td><td>X</td><td>X</td></tr>
</table>

Protection, Mitigation, and Enhancement Measures	Surrender Application	
	Phase 2a	**Phase 2b**
Water Quality and Erosion Control Measures		
• PG&E will develop a Stormwater Pollution Prevention Plan prior to restoration activities. • PG&E will implement construction-related BMPs to control erosion during implementation of restoration activities. • PG&E will obtain and implement resource agency and construction permits for restoration activities, following water quality BMPs and complying with local, state, and federal laws, as needed: – United States Army Corps of Engineers Section 404 Clean Water Act Permit; – State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification; and – State Water Resources Control Board Construction General Permit/Stormwater Pollution Prevention Plan.	X	X
Post-construction Water Quality and Water Temperature Monitoring Plan		
PG&E will develop a Post-construction Water Quality and Water Temperature Monitoring Plan. Goal: Define measures to monitor water quality and water temperature in the Eel River after removal of the dams and define a process to address potential issues, if needed	X	X
Erosion Prevention Restoration Plan		
PG&E will develop an Erosion Prevention Plan for implementation during restoration activities. Goal: Define measures to reduce potential soil erosion and runoff during restoration activities after dam removal	X	

[1] Restoration refers to all active restoration actions that require the use of heavy equipment or helicopters as part of the implementation of the Restoration Plan or Sediment/Channel Monitoring Response Plan. The goals of the Restoration Plan are provided in Table 2-11.

2.3 References

CDFW (California Department of Fish and Wildlife). 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities.

FERC (Federal Energy Regulatory Commission). 1975. Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters and Lands of the United States. October 1975.

FERC (Federal Energy Regulatory Commission). 1983. Opinion and order denying appeal, approving settlement, and issuing new license. October 4.

FERC (Federal Energy Regulatory Commission). 2004. Order amending license. January 28.

McMillen. 2024. Potter Valley Project diversion facilities preliminary engineering report (Sonoma Water Contract #TW 22/23-006). April 12.

McMillen Jacobs Associates. 2021. Scott Dam and Cape Horn Dam removal alternatives technical memo. Prepared for Two-Basin Solution Partners, November.

National Marine Fisheries Service. 2002. Biological Opinion for Proposed License Amendment for the Potter Valley Project (FERC Project Number 77-110).

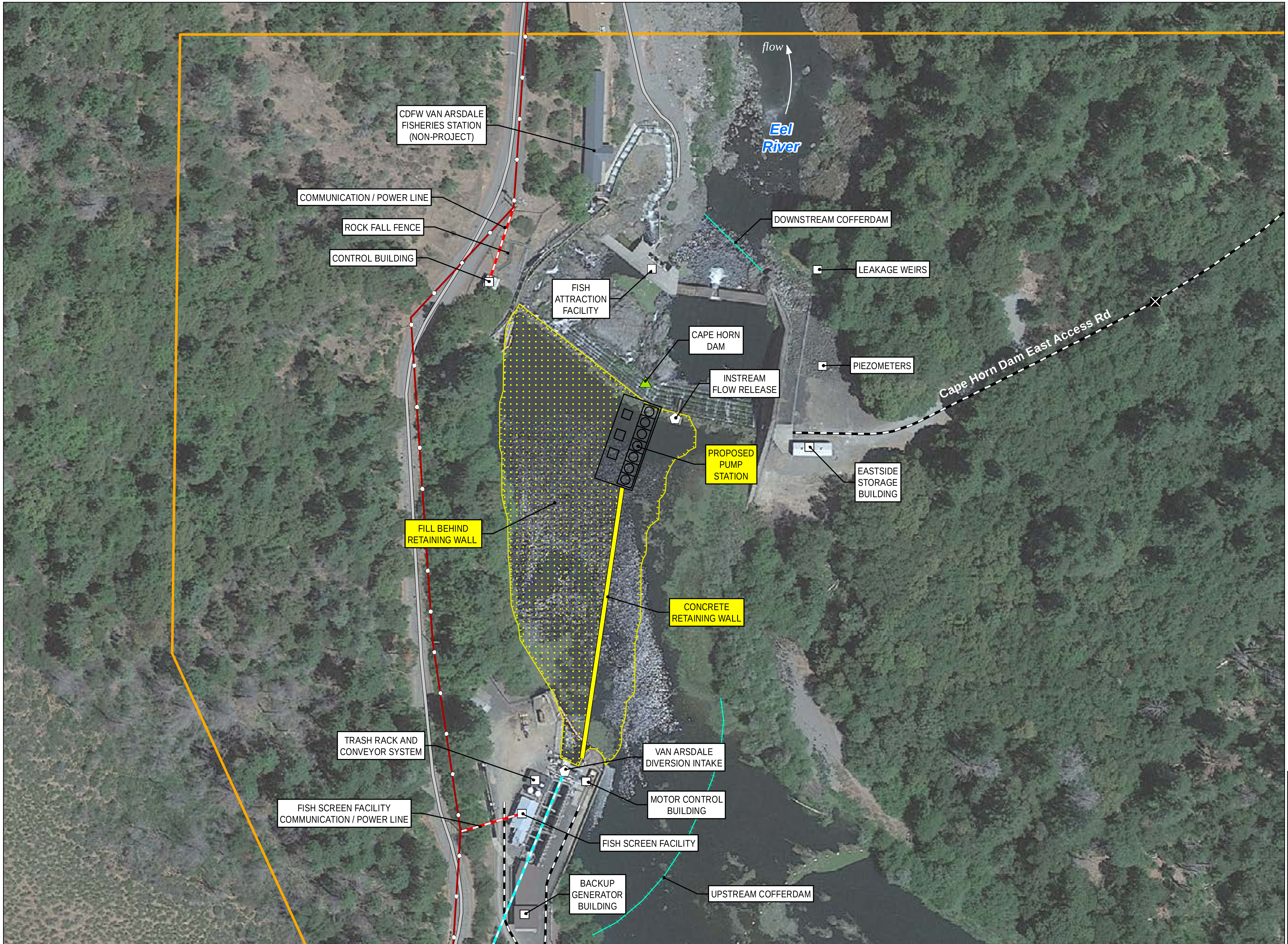
PG&E (Pacific Gas and Electric). 1994. Potter Valley Project – FERC 77, Revised Exhibit M. November 7.

PG&E (Pacific Gas and Electric). 2017. Lake Pillsbury Bathymetric Survey – 2016. PG&E Applied Technology Services Report No. 026.11-16.3.

PG&E (Pacific Gas and Electric). 2019. TERR 1 – Botanical Resources Data Memorialization, Technical Study Summary. Stillwater Sciences. Prepared for Pacific Gas and Electric Company (Susan Kester). Potter Valley Project (FERC Project No. 77). December 5.

USFWS (U.S. Fish and Wildlife Service). 2007. National bald eagle management guidelines.

USSD (U.S. Society on Dams). 2015. Guidelines for dam decommissioning projects. Prepared by the USSD Committee on Dam Decommissioning.



PG&E Project Facilities

- Dam
- Water Conveyance Feature
- Ancillary and Other Facilities
- Water Conduit
- Communication / Power Line
- FERC Project Boundary

Other Features

- Project Road
- Non-Project General Access Road
- Distribution or Powerline (Non-project)
- Gate

NERF Construction Activities

- Concrete Retaining Wall
- NERF Construction Area (1.24ac)
- Fill Behind Retaining Wall (0.86ac)

Pacific Gas and Electric Company

PG&E Potter Valley Project
FERC Project No. 77

Map 2-11a

NERF construction area at Cape Horn Dam

0 25 50 100 Feet

Date: 12/17/2024

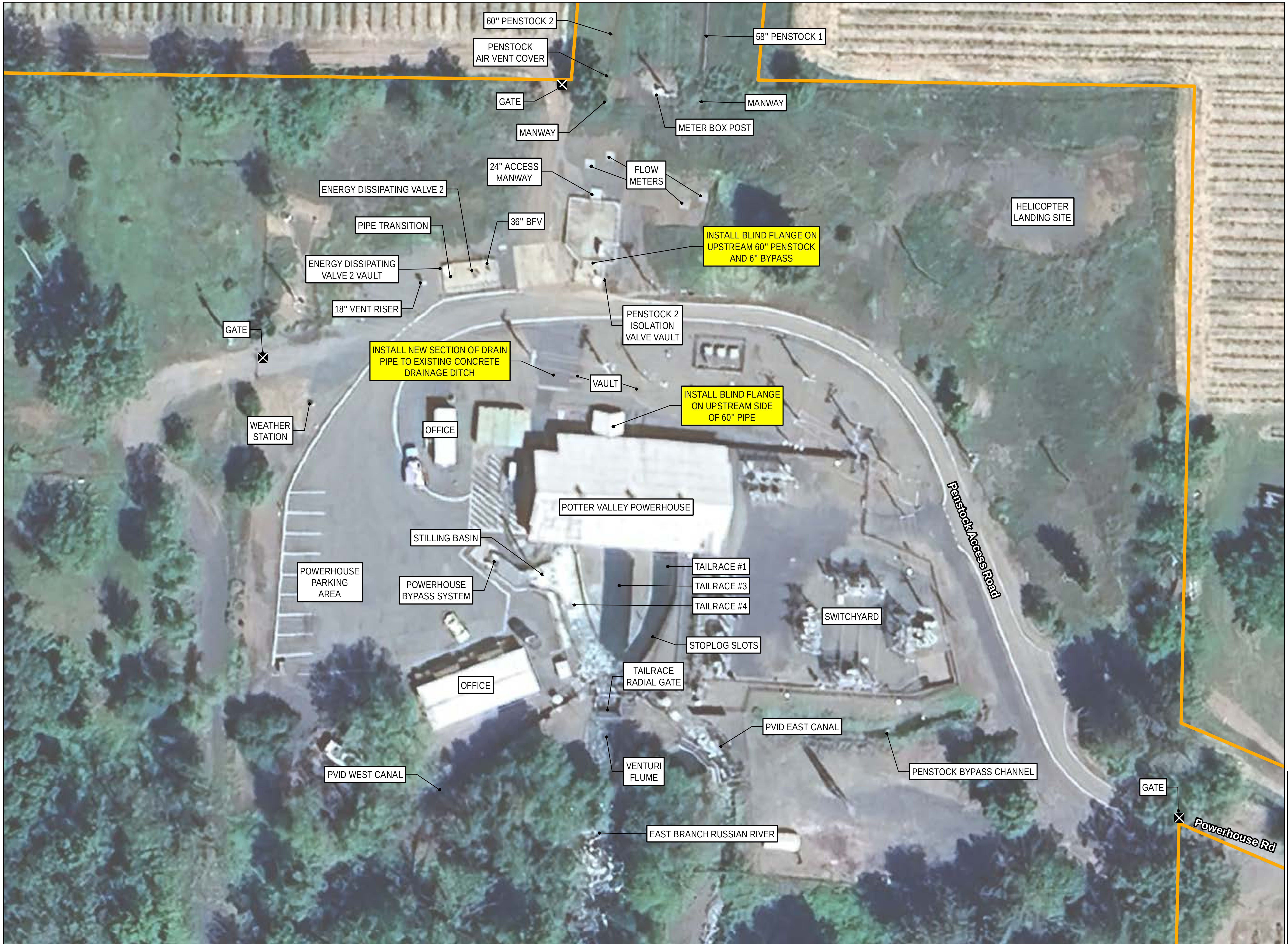
Projection: UTM Zone 10 N
Datum: NAD 83

C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\FacilitiesMaps\Map 2-11a NERF_Construction_CHD_11i17i_13.mxd

This Page Intentionally Left Blank

PG&E Project Facilities

- FERC Project Boundary
- Gate
- NERF Construction Activities
- Potter Valley Project Facilities



Pacific Gas and Electric Company

PG&E Potter Valley Project
FERC Project No. 77

Map 2-11b

NERF construction area at Potter Valley Powerhouse

Date: 12/12/2024

0 10 20 40 60 Feet

Projection: UTM Zone 10 N
Datum: NAD 83

C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\FacilitiesMaps\Map 2.2.X-X NERF_Construction_PVP_11i17i_10.mxd

This Page Intentionally Left Blank

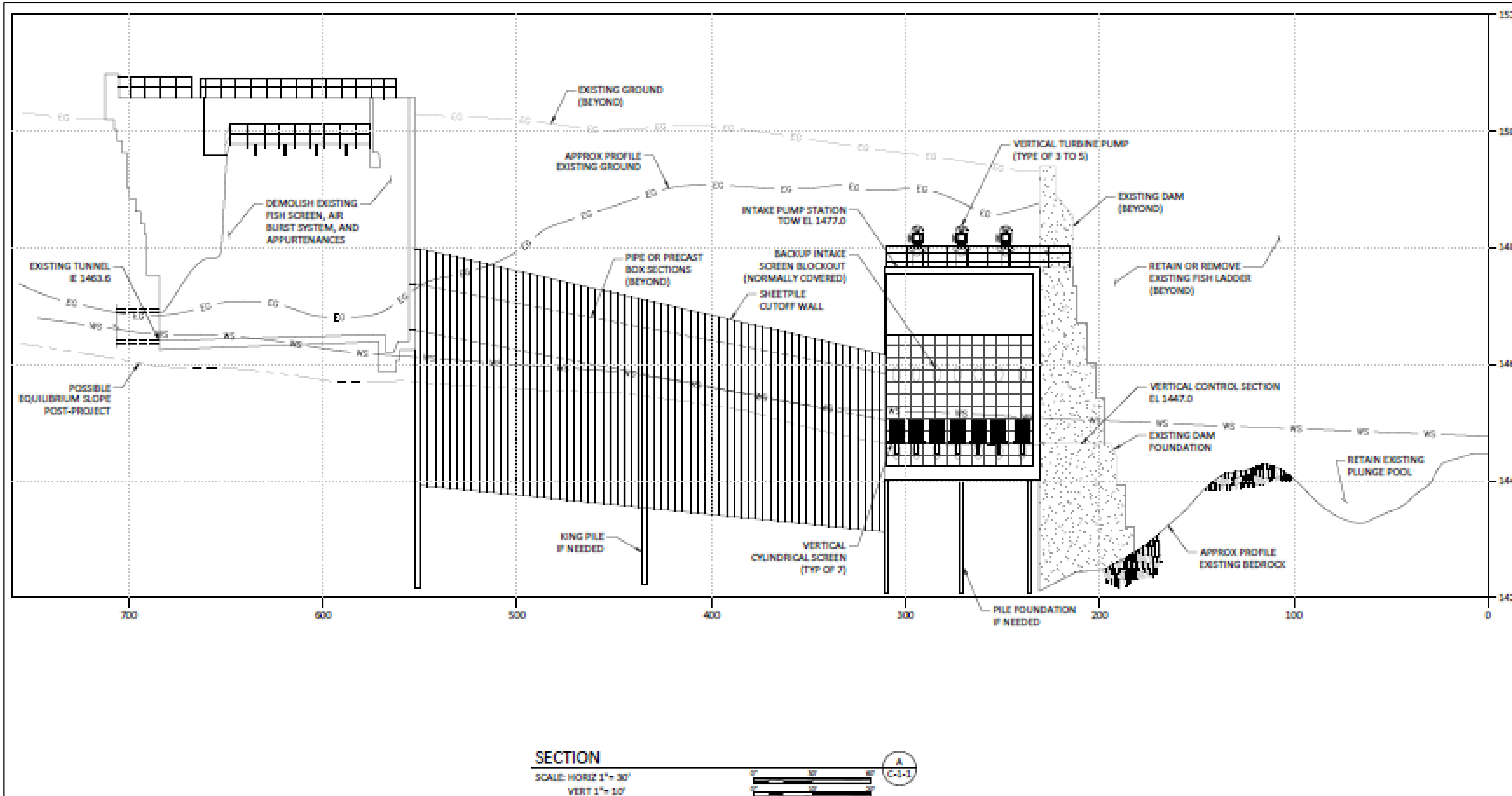


Figure 2-7. NERF control section with pump station conceptual profile.

This Page Intentionally Left Blank

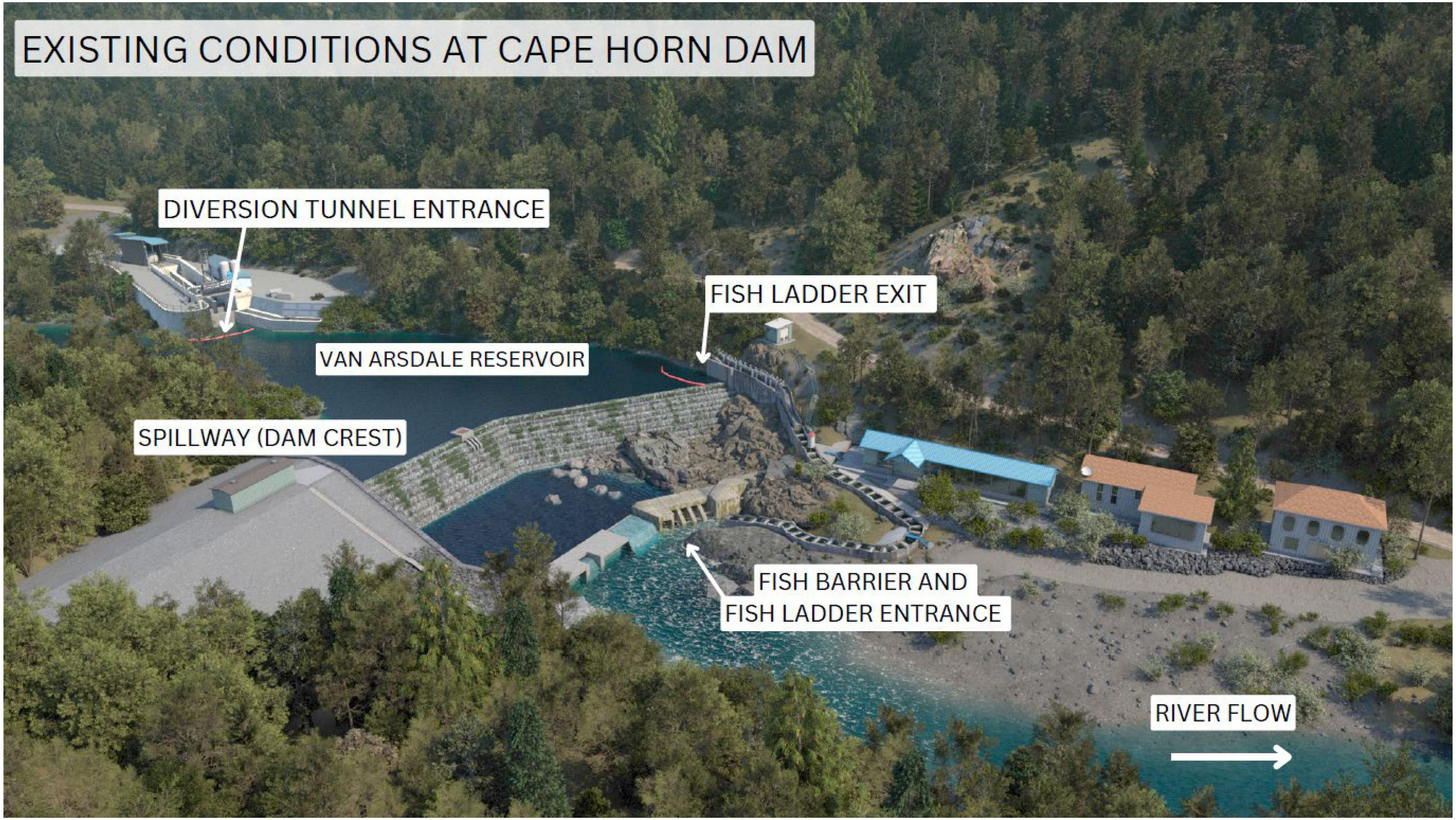


Figure 2-8. Existing conditions at Cape Horn Dam (artist rendering).

This Page Intentionally Left Blank

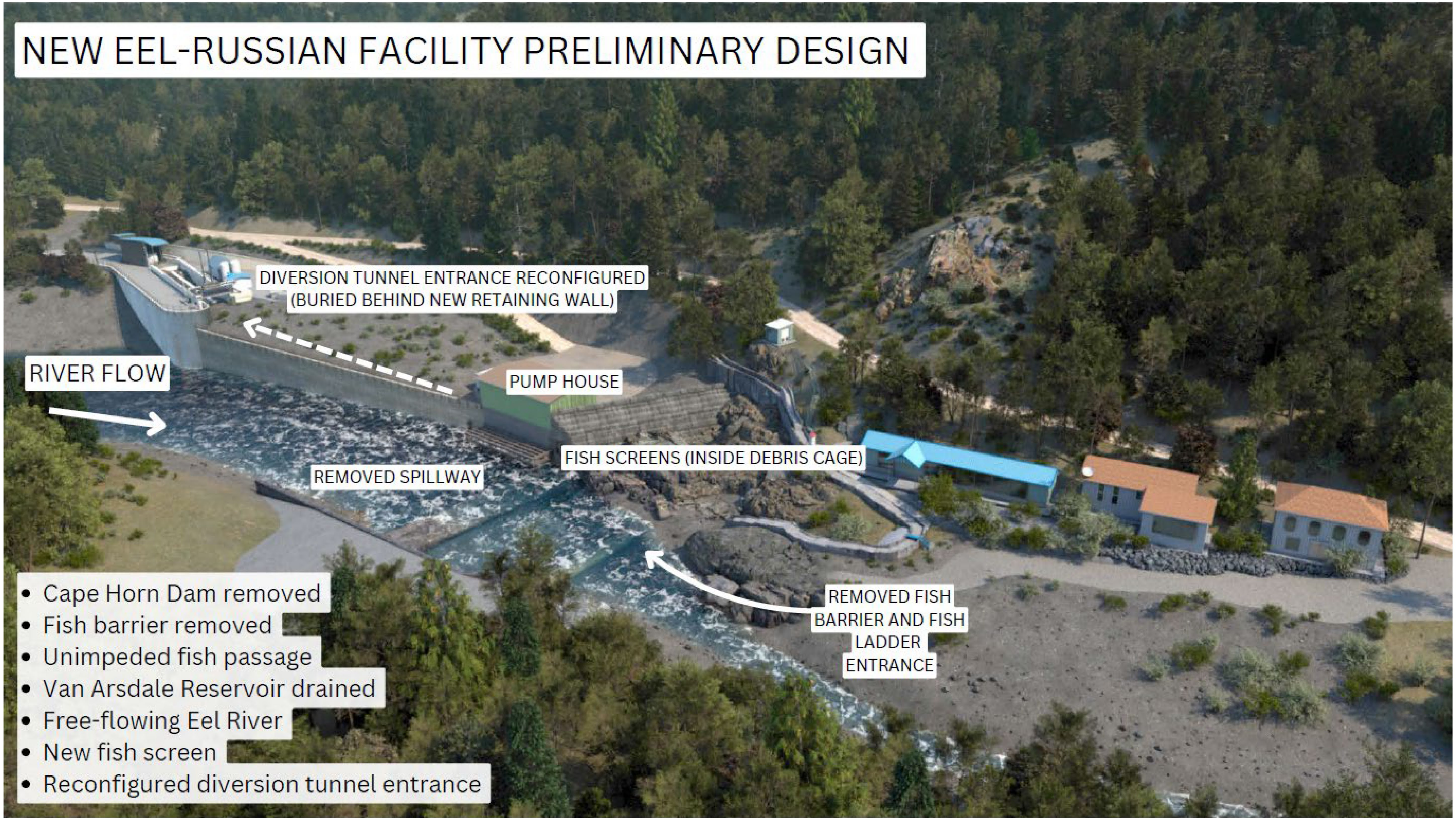


Figure 2-9. NERF preliminary design upstream of deconstructed Cape Horn Dam (artist rendering).

This Page Intentionally Left Blank

Figure 2-10. Existing conditions at Cape Horn Dam, facing upstream (artist rendering).

This Page Intentionally Left Blank

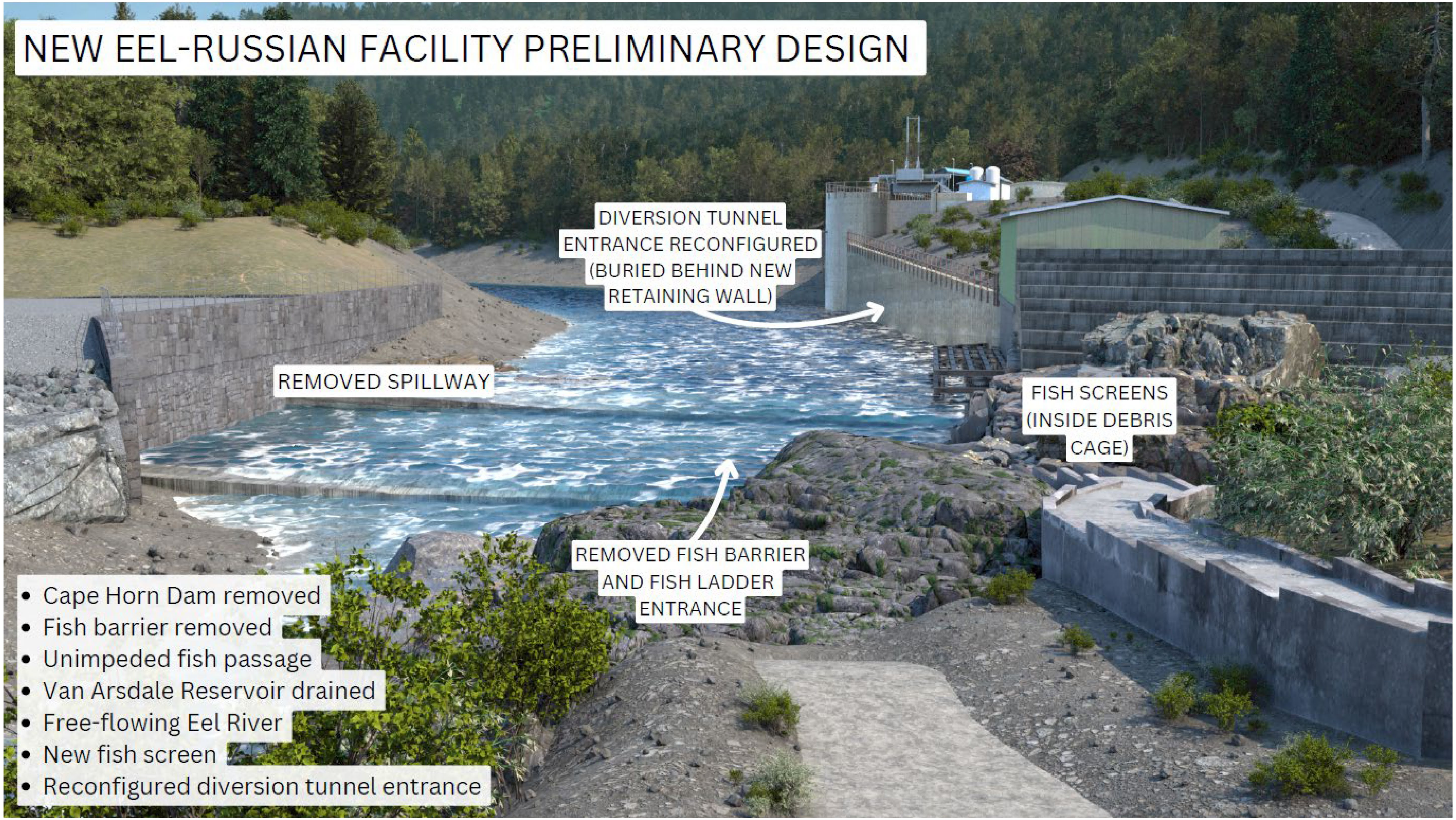


Figure 2-11. NERF preliminary design (facing upstream) (artist rendering).

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
Project	Potter Valley Hydroelectric Project

This Page Intentionally Left Blank

3.0 ENVIRONMENTAL ANALYSIS

This section follows the Federal Energy Regulatory Commission's (FERC) content requirements in Title 18 of the Code of Federal Regulations § 6.1, which specifies that an application for a license surrender must be filed in the same form and manner as an application for a license.

Section 3.0 provides the environmental analysis for the Application for Surrender of License and Application for the Non-Project Use of Project Lands.

3.1 Environmental Analysis Approach

Section 3.0 provides a description of the existing environment that characterizes the resources in the vicinity of the Potter Valley Hydroelectric Project (Project) to understand where resources could potentially be affected by the Proposed Action, which includes both the application for license surrender and the application for the non-Project use of Project lands. The potential effects of implementing Pacific Gas and Electric Company's proposed decommissioning and restoration plans and the construction of the New Eel-Russian Facility (NERF) are analyzed separately. Cumulative impacts are also evaluated separately for each application.

Section 3.0 is organized as follows:

- **Section 3.2, General Description of the River Basin**, provides a general description of the river basin.
- **Section 3.3, Affected Environment**, provides a detailed description of the environment that could be potentially affected by the Proposed Action by resource area. Each resource is described in the vicinity of the Project to better understand where resources are located that could potentially be affected by the Proposed Action (study area). The study area varies by resource and is larger than the area of the potential Project effects.
- **Section 3.4, Application for Surrender of License – Environmental Effects**, presents the analytical approach for, and evaluation of, the potential effects of license surrender on environmental and cultural resources. Cumulative analysis of operation of the NERF is also presented in this section.
- **Section 3.5, Application for Non-Project Use of Project Lands – Environmental Effects**, presents the analytical approach for, and evaluation of, the potential effects of non-Project use of Project lands on each of the resources described in Section 3.3. Potential impacts are presented for the short-term construction effects of the NERF. This section also evaluates potential cumulative impacts.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

ac-ft	acre-feet
Basin Plan	Water Quality Control Plan for the North Coast Region
CDFW	California Department of Fish and Wildlife
cfs	cubic feet per second
CORA	constant radius arch
DSOD	Division of Safety of Dams
DWR	California Department of Water Resources
ERRK	earth and rock
FERC	Federal Energy Regulatory Commission
FLBT	flashboards and buttress
fpm	feet per mile
ft.	feet/foot
GNIS	Geographic Names Information System
GRAV	gravity
HYDF	hydraulic fill
kW	kilowatt
mi.	mile(s)
$mi.^2$	square miles
MNF	Mendocino National Forest
NCRWQCB	North Coast Regional Water Quality Control Board
NMFS	National Marine Fisheries Service
OHWM	ordinary high water mark
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
PVID	Potter Valley Irrigation District
RM	river mile
SLBT	slab and buttress
State Water Board	State Water Resources Control Board
Tr	Tributary
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

3.2 General Description of the River Basins

3.2.1 Introduction

This section provides a general description of the river basins in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project), which is located in the Eel River and Russian River watersheds. This section provides the following information organized by watershed: (1) area of river and subbasins and lengths of stream reaches; (2) major land and water uses in the Project vicinity; (3) dams and diversion structures; and (4) potentially affected tributary rivers and streams.

3.2.2 Information Sources

This section was prepared using the following primary information sources:

- Final Environmental Impact Statement for the Potter Valley Project, No. 77-California (Federal Energy Regulatory Commission [FERC] 1978);
- Sonoma Water's website (Sonoma Water 2023);
- Report of the Water Management Technical Subcommittee – River Mile Index (Pacific Southwest Inter-Agency Committee 1973);
- Water Quality Control Plan for the North Coast Region (Basin Plan) (North Coast Regional Water Quality Control Board [NCRWQCB] 2018);
- Geographic Names Information System (GNIS; U.S. Geological Survey [USGS] 2023);
- Dams within the Jurisdiction of the State of California (California Department of Water Resources [DWR], Division of Safety of Dams [DSOD] 2022);
- Sonoma County General Plan 2020 (Sonoma County 2008); and
- U.S. Forest Service (USFS), Mendocino National Forest (MNF) – Land and Resource Management Plan (USFS 1995) and Amendment 2007-01 (USFS-MNF 2007).

3.2.3 Overview

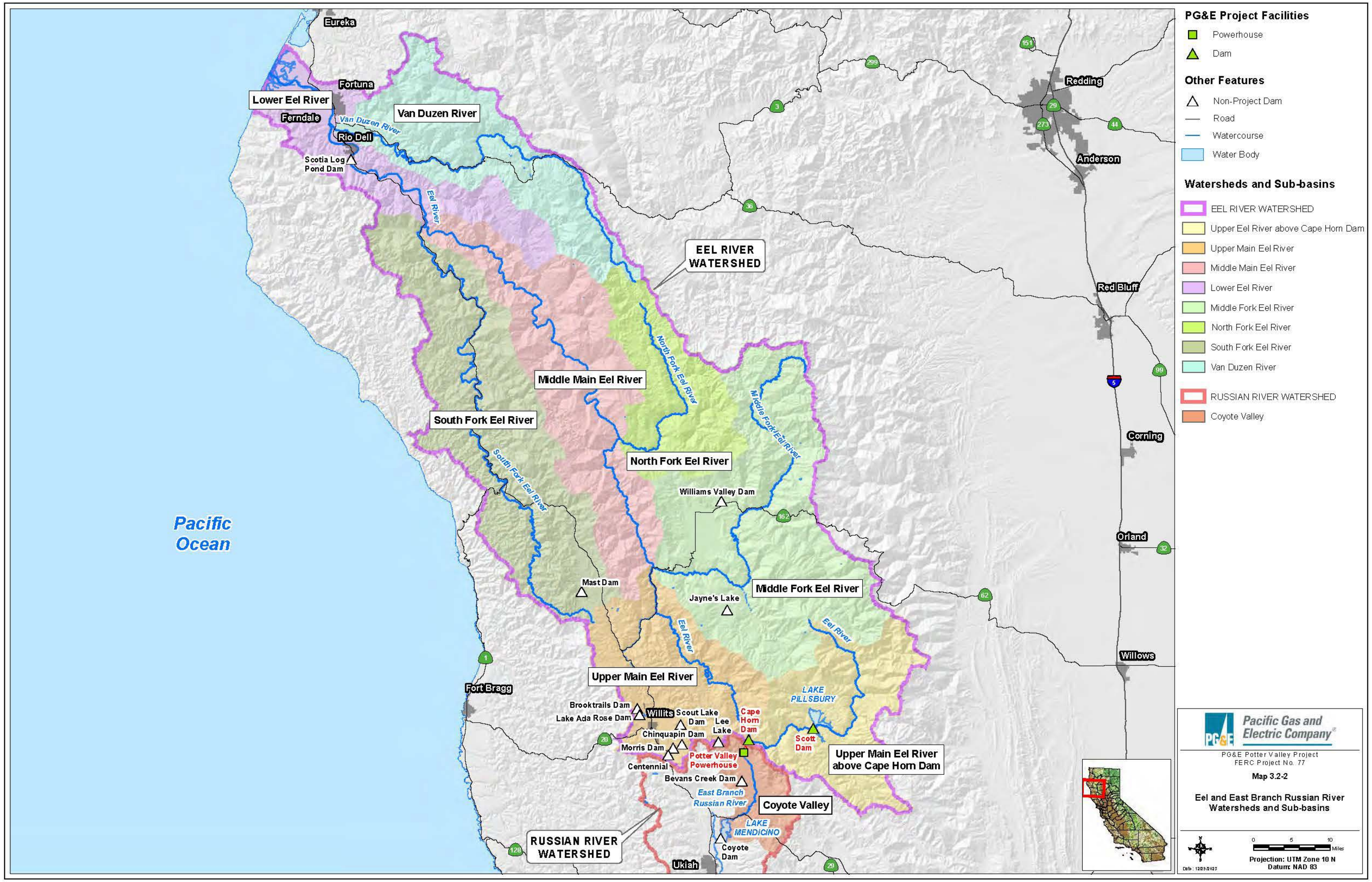
The Project facilities are located in northern California, in Lake and Mendocino counties, within the Eel River and Russian River watersheds (Map 3.2-1). As shown on Map 3.2-2, the Project reservoirs, Lake Pillsbury and Van Arsdale Reservoir, are located in the Eel River Watershed. Lake Pillsbury is the Project's storage reservoir. Below Lake Pillsbury (behind Scott Dam), the Eel River flows approximately 12 miles (mi.) to Van Arsdale Reservoir (behind Cap Horn Dam), where water is diverted and conveyed to the Potter Valley Powerhouse, located on the East Branch Russian River in the Russian River Watershed (Map 3.2-2). Releases from both Lake Pillsbury and Van Arsdale Reservoir support salmon and steelhead populations in the Eel River Watershed. Releases from the powerhouse are a source of water in the East Branch Russian River and for local water users.

This Page Intentionally Left Blank

C:\GIS\185706343\03_data\gis_cad\map\PGE_PotterValley_Watersheds_11i17i_10.mxd

Map 3.2-1 Eel and Russian River watersheds.

This Page Intentionally Left Blank



Map 3.2-2 Eel and East Branch Russian River watersheds and subbasins.

This Page Intentionally Left Blank

The East Branch Russian River flows south from the Potter Valley Powerhouse and is impounded by U.S. Army Corps of Engineers' (USACE's) Coyote Dam to form Lake Mendocino, located approximately 11 mi. downstream.[1] Water from Lake Mendocino is used in Mendocino and Sonoma counties for irrigation, municipal and domestic water supply, recreation, and support of salmon and steelhead populations in the Russian River. Water leaving Lake Mendocino joins with the mainstem Russian River and ultimately drains into the Pacific Ocean near Jenner. The Project and the locations of the primary Project facilities are shown on Map 3.2-3. Jurisdictional boundaries are shown on Map 3.2-4.

3.2.4 Eel River Watershed

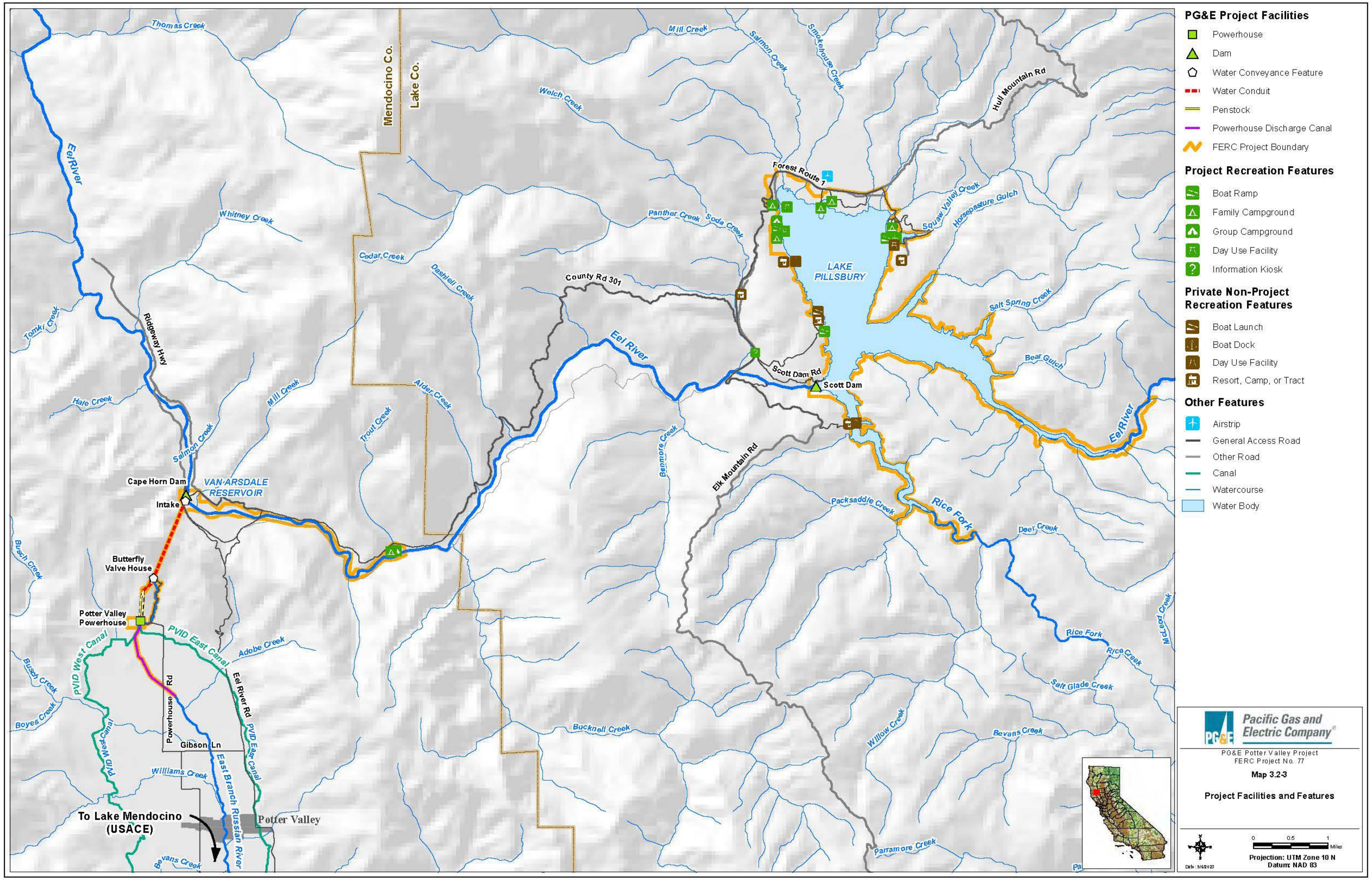
The Eel River drains the third-largest watershed in California. The mainstem of the Eel River is 197 mi. long, has a drainage area of 3,684 square mi. (mi.^{2}), and has a mean annual discharge of 6.5 million acre-feet (ac-ft). From upstream to downstream, the principal tributaries of the Eel River are the Middle Fork Eel River, the North Fork Eel River, the South Fork Eel River, and the Van Duzen River, with drainage areas of 753 mi.^{2}, 283 mi.^{2}, 690 mi.^{2}, and 428 mi.^{2}, respectively. Combined, these four tributaries drain a total of 2,154 mi.^{2}, which equates to over 58 percent of the entire drainage basin. Drainage areas and river lengths for the Eel River and its principal tributaries are summarized in Table 3.2-1. The Eel River Watershed and sub-watersheds are depicted on Map 3.2-2.

The Upper Eel River, which is defined as the 78-mi.-long segment of the Eel River from its headwaters to the confluence with the Middle Fork Eel River, originates on the slopes of Bald Mountain at an elevation of approximately 6,739 feet (ft.) above mean sea level and drains 708 mi.^{2}. From its headwaters, the Upper Eel River flows in a southerly direction for approximately 23 mi. before turning westward and flowing into Lake Pillsbury, formed by Scott Dam, descending an average of 200 feet per mile (fpm) in this reach. Below Lake Pillsbury, the river flows westward for approximately 12 mi. to Van Arsdale Reservoir, formed by Cape Horn Dam, descending an average of 29 fpm. Downstream from Van Arsdale Reservoir, the Eel River turns northwestward, dropping an average of 16 fpm to its confluence with the Middle Fork Eel River located approximately 37.5 mi. downstream of Cape Horn Dam. Major tributaries between Scott Dam and the Middle Fork Eel River confluence include Soda Creek, Tomki Creek, and Outlet Creek, from upstream to downstream. Soda Creek meets the Eel River between Scott Dam and Van Arsdale Reservoir. Tomki and Outlet creeks flow into the Eel River downstream of Cape Horn Dam.

Downstream of the Middle Fork Eel River confluence, the Eel River continues northward for approximately 119 mi. toward the city of Eureka, located along the northwest coast of California. Downstream of the unincorporated community of Fernbridge, the Eel River transitions to estuary.

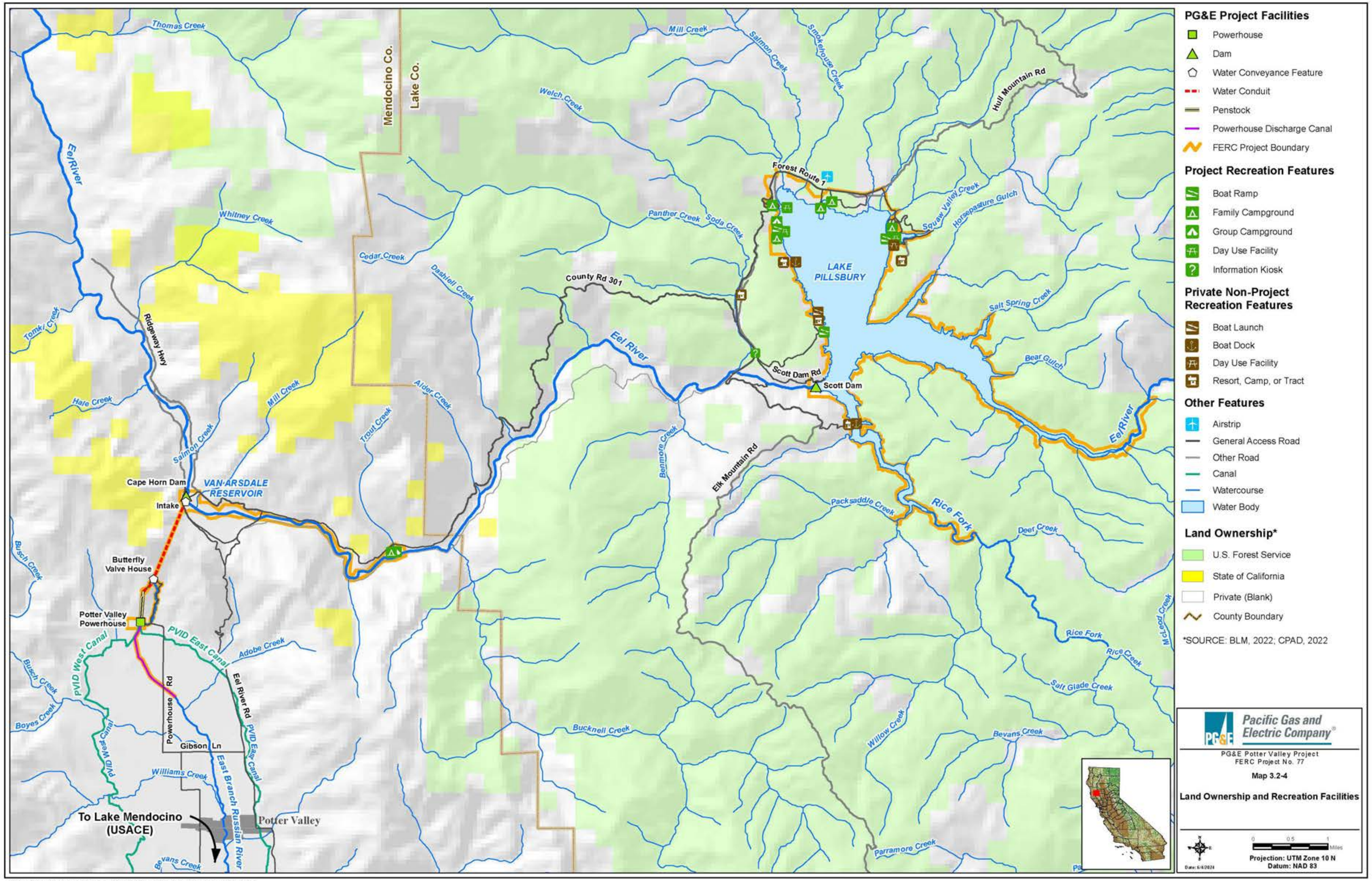
[1] The distance between the Potter Valley Powerhouse and the ordinary high water mark (OHWM) of Lake Mendocino is approximately 11 mi. The OHWM of Lake Mendocino is located at 764.8 ft. above mean sea level, the elevation of the Coyote Dam Spillway.

This Page Intentionally Left Blank



Map 3.2-3 Project facilities and features.

This Page Intentionally Left Blank



Map 3.2-4 Land ownership and recreation facilities.

This Page Intentionally Left Blank

Table 3.2-1 Lengths and drainage areas of the Eel River and East Branch Russian rivers.

Watershed/River	River Mile (RM) Location[a]	Length of Primary River/Stream (mi.)[a]	Drainage Area ($mi.^2$)[b]
Eel River Watershed	**-**	**-**	**3,684**
Eel River – Headwater to Middle Fork Eel	**197–119.3**	**77.7**	**708**
Headwater	197.0	-	-
Lake Pillsbury Inlet	173.2	-	-
Scott Dam (Lake Pillsbury)	168.5	-	-
Cape Horn Dam (Van Arsdale Reservoir)	156.8	-	-
Cape Horn Dam to Middle Fork Eel River	156.8–119.3	-	359
Eel River – Middle Fork Eel River to Mouth	**119.3–0**	**119.3**	**2,976[c]**
Middle Fork Eel River	119.3	69.9	753
North Fork Eel River	97	34.8	283
South Fork Eel River	40.5	105.3	690
Van Duzen River	13.3	74.4	428
Other Subbasins (Combined)	-	-	822
Mouth of Eel River	**0**	**-**	**-**
East Branch Russian River Watershed (Potter Valley Powerhouse Tailrace to Lake Mendocino Ordinary High Water Mark)	**-**	**11**	**93[c]**

Notes:

[a] Eel River miles and lengths are from *Report of the Water Management Technical Subcommittee - River Mile Index* prepared by the Pacific Southwest Inter-Agency Committee Technical Subcommittee (June 1973), unless otherwise noted.

[b] Drainage area includes contributions from all tributaries.

[c] Values are from Calwater 2.1.1 (California Department of Fish and Game [now California Department of Fish and Wildlife] 2004).

3.2.4.1 Major Land Uses in the Eel River Watershed

The Eel River Watershed is located entirely in the Northern Coast Range and is characterized by steep and heavily forested terrain, with minimal development. Highway 101 provides the main access through the watershed. The largest population centers in the watershed are small cities and unincorporated communities, including Willits, Garberville, Redway, Rio Dell, Scotia, Fortuna, and Ferndale. The largest community near the Project is the city of Ukiah, with a population of 16,607 as of the April 1, 2020, census (U.S. Census Bureau 2023). Ukiah is located in the Russian River Watershed (discussed below).

The Eel River Watershed includes public lands managed by the State of California, including the Admiral William Standley State Recreation Area, Smithe Redwoods State Recreation Area, Standish-Hickey State Recreation Area, Humboldt Redwoods State Park, and Richardson Grove

State Park. In addition, approximately 683,000 acres of the MNF and Six Rivers National Forest are located within the Eel River Watershed (FERC 1978).

About 70 percent of the total land mass in the watershed is forested with moderate to heavy stands of redwood and other conifers (FERC 1978). As such, logging and the production of forest products has occurred historically and continues today. Other land uses in the watershed include agriculture, cultivation of cannabis, recreation, and tourism. Whitewater boating is popular along the Eel River. Commercial and recreational fishing is prohibited or restricted along most of the Eel River pursuant to California Department of Fish and Wildlife (CDFW) regulations.

Above Lake Pillsbury, the Eel River primarily runs through public land managed by the MNF, including the Snow Mountain Wilderness Area. The Eel River upstream of Lake Pillsbury is relatively remote, with limited public access. The MNF manages this area primarily to maintain, preserve, and enhance fish and wildlife habitat. Recreation use is low and consists primarily of dispersed activities such as fishing, hunting, and hiking (USFS-MNF 1995, 2007). Past logging activity has been intermittent and light due to low volumes and poor economic feasibility (USFS-MNF 1995, 2007). Grazing is permitted in select areas.

Scott Dam and Lake Pillsbury are located for the most part on land owned by PG&E that is within the boundaries of the MNF. Lake Pillsbury is the largest water body within the boundaries of the MNF and is a regionally important recreation destination. Land use in the immediate vicinity of Lake Pillsbury is primarily dedicated to hydropower generation and recreation. A variety of recreation facilities, including campgrounds, day-use areas, boat docks, resorts, and rural and recreation residences are in the immediate vicinity of Lake Pillsbury, both inside and outside of the FERC Project boundary. The surrounding area supports dispersed recreation activities, including off-highway vehicle use.

Between Lake Pillsbury and Van Arsdale Reservoir, the Eel River primarily runs through land owned by PG&E[2] with intermittent parcels under the jurisdiction of the MNF. Due to the river canyon's steep slopes, development along this segment is primarily limited to one family campground and one group campground located approximately 2 mi. above Van Arsdale Reservoir.

The land underlying the high-water mark of Van Arsdale Reservoir is owned by PG&E. The land surrounding the reservoir is owned by PG&E and other private parties. Land use in the Van Arsdale Reservoir area primarily consists of hydropower generation, sparse residential development, and limited recreation use.

[2] A portion of the land along Benmore Creek that is currently owned by PG&E will be donated to USFS. Similarly, portions of the land on the north side of Van Arsdale Reservoir that are currently owned by PG&E will be donated to the Potter Valley Tribe.

Downstream of Van Arsdale Reservoir, the Eel River runs through privately owned land. Therefore, public access and development opportunities along the Eel River downstream of Van Arsdale Reservoir are limited. The 58,600-acre Round Valley Reservation is located on the east side of the Eel River, at the confluence with the North Fork Eel River.

Beginning about 300 feet downstream of Cape Horn Dam to its mouth near Fortuna, the Eel River and its four main tributaries (Middle Fork Eel, North Fork Eel, South Fork Eel, and Van Duzen River) are designated by U.S. Congress as Wild and Scenic Rivers, reflecting the relatively undeveloped nature of the watershed.[3] The Eel River and its tributaries together include 97 mi. of river classified as "wild," 28 mi. of river classified as "scenic," and 273 mi. of river classified as "recreational" (National Wild and Scenic Rivers System n.d.). Various sections of the river and its main tributaries cross land managed by Bureau of Land Management, California Resources Agency, and USFS.

The Eel River empties into the Pacific Ocean in Humboldt County, approximately 13 mi. south of the city of Eureka. A large delta covering approximately 88 $mi.^2$ (54,500 acres) has formed at the mouth of the Eel River (FERC 1978). The delta region is a productive agricultural area, used primarily for farming and grazing. The entire Eel River estuary is protected by the California Bays and Estuaries Policy, which focuses on preventing water quality degradation to protect the beneficial uses of waters in enclosed bays and estuaries. In 2008, the Wildlands Conservancy purchased about 1,100 acres of land at the mouth of the Eel River. This area is now managed as a preserve in partnership with California Trout, the Coastal Conservancy, and CDFW.

3.2.4.2 Dams and Diversions in the Eel River Watershed

The Basin Plan (NCRWQCB 2018) states that the Project is the only major surface water development in the Eel River Watershed (referred to by the State Water Resources Control Board [State Water Board] as the Eel River hydrologic unit [No. 111.00]). However, as shown on Map 3.2-2, 12 small dams are located in the Eel River Watershed, mainly on small tributaries to the Eel River. Pertinent, available information related to these dams is summarized in Table 3.2-2 and is based on information from the USGS GNIS (2023) database and the California DWR-DSOD database (DWR-DSOD 2022).

3.2.4.3 Potentially Affected Tributary Rivers and Streams

Project operations are considered to affect the following segments of the Upper Eel River:

- Eel River from the inlet to Lake Pillsbury at river mile (RM) 173.2 to Scott Dam located 4.7 mi. downstream, at RM 168.5, currently inundated by Lake Pillsbury;

[3] Refer to Section 3.3.10, Aesthetic Resources, for additional information related to the National Wild and Scenic Rivers System.

- Eel River from Scott Dam to Cape Horn Dam, located approximately 12 mi. downstream at RM 156.8; and
- Eel River from Cape Horn Dam to the Middle Fork Eel River confluence, located 37.5 mi. downstream, at RM 119.3.

Below the Middle Fork Eel River, potential hydrologic effects of the Project are significantly diminished due to inflow from the Middle, South, and North forks of the Eel River and the Van Duzen River.

Table 3.2-2 Small dams in the Eel River Watershed.

DOSD Dam No.	National ID	Name	Owner	County	River/Stream	Year Built	Capacity (acre-feet)[c]	Reservoir Area (acres)	Dam Type
1-041	CA00030	Benbow Dam[a]	California Department of Parks and Recreation	Humboldt	South Fork Eel River	1932	1,060	123	SLBT
1338-003	CA00872	Brooktrails 3 North	Brooktrails Community Service District	Mendocino	Willits Creek	1970	275	10	Earth
2036-2	CA01246	Centennial	City of Willits	Mendocino	James Creek	1990	655	31	Earth
1089-003	CA00975	Chinquapin Dam	Mendocino County	Mendocino	Moore Creek	1971	45	4	Earth
2385-0	CA01262	Jayne's Lake	Eden Valley Ranch, LLC	Mendocino	Toney Creek	1985	1,225	50	Earth
1038-000	CA00871	Lake Ada Rose Dam	Brooktrails Community Service District	Mendocino	Tr Willits Creek	1964	138	7	Earth
NA	NA	Lee Lake Dam[b]	Unknown	Mendocino	Long Branch Creek	Unknown	Unknown	3.5	Earth
1380-000	CA0972	Mast Dam	Stacy Holland	Mendocino	Tr Cahto Creek	1963	380	14	Earth
2036-000	CA00406	Morris Dam	City of Willits	Mendocino	James Creek	1927	845	46	CORA
205-000	CA00504	Scotia Log Pool Dam	Pacific Lumber Company	Humboldt	Tr Eel River	1910	210	30	Earth

DOSD Dam No.	National ID	Name	Owner	County	River/Stream	Year Built	Capacity (acre-feet)[c]	Reservoir Area (acres)	Dam Type
389-000	CA00563	Scout Lake Dam	Boy Scouts of America San Francisco Bay Area Council	Mendocino	Tr Berry Creek	1964	1,140	70	Earth
1381-000	CA00973	Williams Valley Dam	Roger A. and Michelle M. Burch	Mendocino	Tr Short Creek	1965	200	15	Earth

Sources: DWR-DSOD 2022; USGS 2023

Notes: CORA = constant radius arch
ID = identification
NA = not available
SLBT = slab and buttress
Tr = tributary

[a] Benbow Dam was removed in 2017.
[b] Lake Lee is not under the jurisdiction of DSOD and does not have a dam number or national ID number.
[c] Some reservoir areas were estimated using ESRI World Imagery, Maxar Satellite Imagery, 2021–2022 (ESRI 2021–2022).

3.2.5 Russian River Watershed

The Russian River Watershed is less than half the size of the Eel River Watershed and drains an area of approximately 1,484 mi.^{2}. The 110-mi.-long Russian River begins in the Laughlin Range about 5 mi. east of Willits, in Mendocino County. From its headwaters, the river generally flows southward, passing east of the town of Healdsburg, and eventually meanders southwestward to the Pacific Ocean. The mouth of the Russian River is located in Sonoma County, near the small coastal town of Jenner.

The Potter Valley Powerhouse is located in the Upper Russian River Watershed, on the East Branch Russian River. Releases from the powerhouse are a significant source of water in the East Branch Russian River and for local water users. Water from Lake Mendocino is used in Mendocino and Sonoma counties for irrigation, municipal and domestic water supply, and recreation, and to support salmon and steelhead populations in the Russian River.

Below the powerhouse, the East Branch Russian River flows south through the Potter Valley and into Lake Mendocino, which is formed by Coyote Dam. After passing through Lake Mendocino, the East Branch Russian River joins the mainstem Russian River. Other notable tributaries to the Upper Russian River include Forsythe and York creeks, both of which join the Russian River upstream of the East Branch Russian River confluence, north of Ukiah. Downstream of Ukiah, major tributaries to the Russian River include Feliz Creek, Pieta Creek, Chumisky Creek, Big Sulphur Creek, Dry Creek, Mark West Creek, Green Valley Creek, and Austin Creek.

3.2.5.1 Major Land Uses in the Russian River Watershed

The Russian River Watershed encompasses portions of Sonoma, Mendocino, and Lake counties. The upper portion of the Russian River Watershed is predominately rural, with orchards and vineyards, both important contributors to the local economy. Surface and subsurface water sources are used extensively for irrigation. A portion of the water discharged from the Potter Valley Powerhouse is used to irrigate crops in the Potter Valley. Lake Mendocino, located downstream of Potter Valley, and Lake Sonoma, located in northern Sonoma County, are both used for flood control, irrigation, municipal drinking water supply, and recreation. The largest community near the Project is the city of Ukiah with a population of 16,607 based on the April 1, 2020, census (U.S. Census Bureau 2023). South of Ukiah, the Russian River and its tributaries primarily flow through agricultural lands, dominated by vineyards and orchards. Urban centers in the watershed downstream of Ukiah include Healdsburg, Windsor, Santa Rosa, Sebastopol, Rohnert Park, and Cotati.

3.2.5.2 Dams and Diversions in the Russian River Watershed

A portion of the water released from the Potter Valley Powerhouse is directed at the tailrace into two canals (owned by Potter Valley Irrigation District [PVID]), which deliver water to the east and west sides of Potter Valley. PG&E has a contract to sell and deliver water to PVID. PG&E's obligation under the current contract with PVID is to sell and deliver up to 19,000 ac-ft of water at a rate not to exceed 50 cubic feet per second (cfs), provided the water is available and permitted per PG&E's applicable water rights.

Three small hydroelectric projects are located downstream of Potter Valley Powerhouse on the East Branch Russian River: BES Hydro Project (FERC Project No. 8936), McFadden Hydro Project, and Hammeken Hydro Project, with installed capacities of 400 kilowatt (kW), 330 kW, and 450 kW, respectively. The owners of these three small hydroelectric projects pay headwater benefit charges to PG&E as part of their power purchase agreements. A fourth hydroelectric project (Lake Mendocino Power Project) is located on the outlet conduit of Coyote Dam and is operated by the City of Ukiah (it includes two units with installed capacities of 1,000 kW and 2,500 kW).

The two largest dams in the Russian River watershed are Coyote Dam and Warm Springs Dam, which form Lake Mendocino and Lake Sonoma, respectively. Lake Mendocino has a total storage capacity of 118,000 ac-ft, with 70,000 ac-ft allocated to water supply (Sonoma Water 2023). Lake Sonoma has a total storage capacity of 381,000 ac-ft, with 245,000 ac-ft allocated to water supply (Sonoma Water 2023).

Coyote Dam, which created Lake Mendocino, was originally constructed by USACE. The reservoir is currently operated and managed by USACE for the purposes of flood control and water supply in coordination with Sonoma Water and Mendocino County Russian River Flood Control and Water Conservation Improvement District.

Lake Sonoma, formed by Warm Springs Dam, is located on Dry Creek, a tributary to the Russian River. Warm Springs Dam was originally constructed by USACE for flood protection, but the reservoir is also used for recreation and consumptive purposes and is managed by USACE in coordination with Sonoma Water. The operations of both Lake Mendocino and Lake Sonoma are regulated by a Biological Opinion issued by the National Marine Fisheries Service (NMFS) to USACE, Sonoma Water, and Mendocino County Russian River Flood Control and Water Conservation Improvement District in 2008 (NMFS 2008).

Based on information in the USGS GNIS (2023) and information available via DSOD (DWR-DSOD 2022), 59 other smaller dams are located in the Russian River Watershed. Pertinent information related to these dams is summarized in Table 3.2-3.

3.2.5.3 Potentially Affected Tributary Rivers and Streams

Project operations directly affect the 11-mi.-long segment of the East Branch Russian River between Potter Valley Powerhouse and the ordinary high water mark (OHWM) of Lake Mendocino. Additionally, the water diverted by the Project from the Eel River to the Russian River constitutes a portion of inflows to Lake Mendocino (see Section 3.3.2 for additional information regarding diverted flows to the East Branch Russian River). Although PG&E does not control releases from Lake Mendocino, the water diverted by the Project ultimately affects the Russian River to its confluence with the Pacific Ocean. The Project does not affect any other rivers or streams in the Russian River Watershed.

Table 3.2-3 Small dams in the Russian River Watershed.

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
1002-11	CA01445	Airport Reservoir D	Sonoma Water	Sonoma	N/A	2002	315	11	Earth
1002-6	CA01229	Airport Storage Pond	Sonoma Water	Sonoma	N/A	1985	290	16	Earth
1002-7	CA01202	Airport Storage Pond 2	Sonoma Water	Sonoma	N/A	1989	310	15	Earth
1-070	CA00056	Annadel Number 1 1-070 Dam	State Dept. of Parks and Recreation	Sonoma	Spring Creek	1956	395	35	Earth
1428-000	CA00993	Asti 1428 Dam	E & J Gallo Winery	Sonoma	Tr Russian River	1955	325	14	Earth
421-000	CA00588	Axell 421 Dam	Kendall-Jackson Winery	Sonoma	Tr Franz Creek	1952	155	12	Earth
2420-000	CA01039	Azalea 2420 Dam	Kenneth D. & Barbara J. Dyche	Sonoma	NF Lancel Creek	1955	85	8	Earth
387-000	CA00562	Bevans Creek 387 Dam	Mr. Jon Babcock	Mendocino	Bevans Creek	1955	215	11	ERRK
2429-000	CA01044	Bosch Number 2 2429 Dam	Richard S. Toyfoya	Sonoma	Tr Windsor Creek	1962	37	2	Earth

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
Unknown	CA1263	Bradford	Fountain Ranch, LLC	Mendocino	Unnamed tributary to Russian River	1985	440	24	Earth
3423-000	CA01059	Budge 3423 Dam	Jordan Vineyard & Winery	Sonoma	Tr Russian River	1964	110	13	Earth
5420-0	CA01317	Coen C-3	Frei Brothers Reserve and Gallo Glass Company	Sonoma	Unnamed tributary to Dry Creek	1982	480	15	Earth
1428-003	CA01056	Cook Number 2 Dam	E & J Gallo Winery	Sonoma	Tr Dry Creek	1961	82	6	Earth
1385-000	CA01118	Cornett 1385 Dam	Mrs. Mildred Cornett	Mendocino	Tr Russian River	1974	65	6	Earth
1387-000	CA00977	Crawford Ranch 1387 Dam	McDowell Valley Vineyards	Mendocino	Tr McDowell Creek	1972	340	17	Earth
1050-4	CA01272	Delta Pond	City of Santa Rosa	Sonoma	Santa Rosa Creek	1984	1950	90	Earth
1428-4	CA01398	Dennis No. 2	E & J Gallo Winery	Sonoma	Unnamed tributary to Dry Creek	1997	148	60	Earth
1426-000	CA00991	Dina Bob Lake 1426 Dam	Mrs. Robert D. Ogg	Sonoma	Tr Franz Creek	1955	139	14	Earth
1422-000	CA00989	Donovan 1422 Dam	Frederick and Donna Furth	Sonoma	Tr Windsor Creek	1953	70	4	Earth
1428-2	CA01362	Dutcher Creek	E & J Gallo Winery	Sonoma	Barrelli Creek	1992	186	7	Earth

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
428-002	CA01090	Foote #3 Dam	Nancy F. Ogg, et al.	Sonoma	Tr Redwood Cree	1970	77	6	Earth
428-003	CA01091	Foote #4 Dam	Nancy F. Ogg, et al.	Sonoma	Tr Kellogg Creek	1976	117	7	Earth
1002-8	CA1057	Foothill Regulating Park	County of Sonoma Regional Parks Department	Sonoma	Unnamed tributary to Windsor Creek	1963	109	2	Earth
20-2	CA01431	Foss Creek North Area	City of Healdsburg	Sonoma	Unnamed tributary to Norton Slough	1998	85	N/A	Earth
1050-005	CA00988	Fountaingrove Lake	City of Santa Rosa	Sonoma	Tr Mark West Creek	1953	427	33	Earth
1422-002	CA01089	Greeott 420 Dam	Frederick and Donna Furth	Sonoma	Tr Windsor Creek	1951	100	11	Earth
1002-000	CA00791	Healdsburg Rec 1002 Dam	County of Sonoma Parks Department	Sonoma	Russian River	1953	125	25	FLBT
5423-0	CA01319	John Carl Warnecke	Warnecke Ranch and Vineyards	Sonoma	Unnamed tributary to Russian River	1974	30	3	Earth
421-2	CA00589	Kellogg Ballpark	Kendall Jackson Wine Estates, LTD	Sonoma	Unnamed tributary to Bidwell Creek	1962	376	15	Earth
5421-0	CA01318	Lafranchi Creek	Wine World, Inc.	Sonoma	Lafranchi Creek	1982	100	7	Earth

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
1427-000	CA00992	Lagunita 1427 Dam	Brookfield Investors LLC	Sonoma	Tr Windsor Creek	1954	133	8	Earth
3425-000	CA01060	Lake Helen 3425 Dam	Robert Maddocks	Sonoma	Tr Russian River	1966	192	14	Earth
1050-000	CA00882	Lake Ralphine 1050 Dam	City of Santa Rosa	Sonoma	Tr Santa Rosa Creek	1882	387	19	Earth
Unknown	CA01423	Lolonis Vineyards	Lolonis Family Vineyards and Winery, Inc.	Mendocino	Unnamed tributary to Salt Hollow Creek	1999	209	10	Earth
2427-000	CA01043	Lowe 2427 Dam	Mrs. Paul Foster	Sonoma	Tr Franz Creek	1959	95	10	Earth
2424-000	CA01042	Lytton 2424 Dam	The Salvation Army	Sonoma	Tr Russian River	1956	410	31	Earth
428-000	CA00591	Mallacomes 428 Dam	Nancy Ogg, et al.	Sonoma	Foote Creek	1951	200	12	Earth
1002-004	CA00794	Matanzas Creek 1002-004 Dam	Sonoma Water	Sonoma	Matanzas Creek	1963	1,500	62	Earth
384-000	CA00561	McNab 384 Dam	Fetzer Vineyards	Mendocino	McNab Creek	1947	96	7	Earth
1050-003	CA01104	Meadow Lane 1050-003 Dam	City of Santa Rosa	Sonoma	Off-stream	1979	2,100	100	Earth

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
1089-000	CA00001	Mendocino Middle 1089-000 Dam	Mendocino County	Mendocino	Middle Creek	1908	27	2	GRAV
1089-002	CA00002	Mendocino Upper 1089-002 Dam	Mendocino County	Mendocino	Middle Creek	1915	85	5	GRAV
4426-0	CA1313	Merlo	Private entity	Sonoma	Fall Creek	1982	930	43	Earth
1002-003	CA00793	Mid Fork Brush Creek 1002-003 Dam	Sonoma Water	Sonoma	MF Brush Creek	1961	138	20	Earth
5429-000	CA01061	Murray Dam	Coyote Hills Partnership	Sonoma	Tr Franz Creek	1970	117	6	Earth
4428-000	CA01041	Norton Number 2 Dam	Ridge Vineyards	Sonoma	Tr Dry Creek	1956	102	12	Earth
1002-002	CA00792	Piner Creek 1002-002 Dam	Sonoma Water	Sonoma	Paulin Creek	1962	172	19	Earth
1050-002	CA00883	Pond Number 2 1050-002 Dam	City of Santa Rosa	Sonoma	Off-stream	1652	290	54	Earth
382-000	CA00560	Ridgewood 382 Dam	Walker Lake Association	Mendocino	Forsythe Creek	1829	185	32	HYDF

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
1382-000	CA00974	Round Mountain 1382 Dam	Round Mountain Cooperative Community, Inc.	Mendocino	Tr York Creek	1964	282	17	Earth
1026-000	CA00849	Russian River No. 1 Dam	Russian River Recreation and Park District	Mendocino	Russian River	1963	315	43	FLBT
1420-000	CA00987	Salinger 1420 Dam	Dr. Walter Byck	Sonoma	Tr Mark West Creek	1652	58	4	Earth
1002-005	CA00795	Santa Rosa Creek Reservoir 1002-005 Dam	Sonoma Water	Sonoma	Tr Santa Rosa Creek	1963	3,550	154	Earth
5425-0	CA01320	Shiloh Ranch	Shiloh Homeowners' Association	Sonoma	Unnamed tributary to Pool Creek	1991	432	19	Earth
2422-000	CA01273	Silver Shoon Ranch 2422 Dam (now The Hill Ranch)	Thia Kellner-Hill	Sonoma	Santa Rosa Creek	1955	160	11	Earth
NA	NA	South Saddle Dam[a]	Unknown	Sonoma	Off-stream	Unknown	Unknown	Unknown	Earth
421-002	CA00589	Towibalyla Dam	Kendall Jackson Wine Estates, Ltd.	Sonoma	Tr Franz Creek	1962	376	15	Earth

DSOD Dam Number	National Identification Number	Name	Owner	County	River/Stream	Year Built	Capacity (ac-ft)	Reservoir Area (acres)	Dam Type
3422-000	CA01058	Vineyard Subdivision 3422 Dam	The Vineyards Club, Inc.	Sonoma	Tr Gill Creek	1962	245	25	Earth
NA	NA	West Saddle Dam [a]	Unknown	Sonoma	Off Santa Rosa Creek	Unknown	Unknown	Unknown	Earth

Sources: DWR-DSOD 2022; USGS 2023

Notes: ERRK = earth and rock
FLBT = flashboard and buttress
GRAV = gravity
HYDF = hydraulic fill
MF = middle fork
NF = north fork
SLBT = slab and buttress
Tr = tributary

[a] Dam is not under the jurisdiction of DSOD and does not have a dam number or national identification number.

3.2.6 References

CDFW (California Department of Fish and Wildlife). 2004. California interagency watershed map of 1999 (Calwater) Version 2.2.1. Updated May 2004. Available at: http://frap.fire.ca.gov/data/frapgisdata-sw-calwater_downloadCDFW.

DWR-DSOD (California Department of Water Resources, Division of Safety of Dams). 2022. Dams within the jurisdiction of the State of California. Dams listed alphabetically by county. September 2022.

ESRI. 2021–2022. World imagery, Maxar satellite imagery, 2021–2022.

FERC (Federal Energy Regulatory Commission). 1978. Final Environmental impact statement for the Potter Valley Project, No. 77-California. December.

National Wild and Scenic River System. n.d. National wild and scenic rivers system. Available at: www.rivers.gov.

NCRWQCB (North Coast Regional Water Quality Control Board). 2018. Water quality control plan for the North Coast Region. June. Available at: www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan.

NMFS (National Marine Fisheries Service, Southwest Region). 2008. Biological opinion for water supply, flood control operations, and channel maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River Watershed. Endangered Species Act Section 7 consultation. F/SWR/2006/07316. Issued September 24, 2008.

Pacific Southwest Inter-Agency Committee. 1973. Report of the Water Management Technical Subcommittee – river mile index. June.

Sonoma County. 2008. Sonoma County general plan 2020. Adopted by Resolution No. 08-0808, September 23, 2008. Permits and Resource Management Department. Available at: www.sonoma-county.org/prmd/gp2020.

Sonoma Water. 2023. Water supply. Available at: https://www.sonomawater.org/water-supply.

U.S. Census Bureau. 2023. Population data. Available at: www.census.gov.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 1995. Mendocino National Forest land and resource management plan (LRMP). February. Available at http://www.fs.usda.gov/detailfull/mendocino/landmanagement/.

USFS-MNF. 2007. LRMP amendment 2007-01. Available at: http://www.fs.usda.gov/detailfull/mendocino/landmanagement/.

USGS (U.S. Geological Survey). 2023. Geographic names information system (GNIS). Available at: https://www.usgs.gov/tools/geographic-names-information-system-gnis. Accessed September 2023.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

This Page Intentionally Left Blank

3.3 Affected Environment

Introduction

This section provides a detailed description of the environment to be affected by the proposed Potter Valley Hydroelectric Project (Project) (by each resource area) based on information included in Pacific Gas & Electric Company's (PG&E's) Pre-Application Document for the Project (PG&E 2017), data collected as part of initiation of 21 approved study plans developed as part of the relicensing process (PG&E 2018), and information included in PG&E's Initial Draft Surrender Application and Conceptual Decommissioning Plan (PG&E 2023). Additional information available for environmental and cultural resources within the Project Area from publicly available sources was incorporated, as appropriate.

The affected environment descriptions identify baseline conditions under current operations and maintenance of the Project for each environmental and cultural resource.

References

PG&E (Pacific Gas and Electric Company). 2017. Potter Valley Hydroelectric Project, FERC Project No. 77, Relicensing Pre-Application Document. Volume 1: Public Information Sections 1–7 and Volume 2: Public Information Appendices A–G. April 2017.

PG&E (Pacific Gas and Electric Company). 2018. Potter Valley Hydroelectric Project, FERC Project No. 77, Revised Study Plan. January 2018.

PG&E (Pacific Gas and Electric Company). 2023. Potter Valley Hydroelectric Project, FERC Project No. 77, Initial Draft Surrender Application and Conceptual Decommissioning Plan. November 2023.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Figures

List of Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
AF	acre-foot/feet
AFA	acre-feet per annum
D	domestic
DOI	Department of the Interior
FERC	Federal Energy Regulatory Commission
ft.	feet
FWL	fish and wildlife
I	Irrigation
in.	inches
kW	kilowatts
mi.	miles
MWh	megawatt-hours
NMFS	National Marine Fisheries Service
P	power
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
PVID	Potter Valley Irrigation District
RPA	Reasonable and Prudent Alternative
SWDU	Statement of Water Diversion and Use
U.S.	United States
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

3.3.1 Water Use and Hydrology

This section describes water use and hydrology in the Eel River and East Branch Russian River as they relate to the Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). The Federal Energy Regulatory Commission's (FERC's) regulations require information on both water quantity (water use and hydrology) and water quality for all waters affected by the Project. This section presents information on water quantity. Information on water quality is addressed in Section 3.3.2.

The study area for water use and hydrology includes Lake Pillsbury, Van Arsdale Reservoir, and river reaches potentially affected by Project operations: the Eel River between Scott Dam and Van Arsdale Reservoir, the Eel River between Cape Horn Dam and the Pacific Ocean (approximately 165 river miles [mi.]), and the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino (approximately 11 river mi.).

3.3.1.1 Information Sources

The hydrology information presented in this section was developed using existing gaging data and information available from the United States (U.S.) Geological Survey (USGS 2024a through 2024i), the State Water Resources Control Board, the California Data Exchange Center (CDEC 2024a, 2024b), the California Public Utilities Commission, and data developed by PG&E.

3.3.1.2 Description of the Project

The Project has two reservoirs and one powerhouse, as described in Section 2.1. The upstream reservoir, Lake Pillsbury, is a 69,871-acre-foot (AF) storage reservoir based on bathymetric data collected in 2023 (PG&E 2024); however, in 2023, PG&E dam safety engineers determined that the seismic risk at Scott Dam was greater than previously understood. To reduce the potential seismic risk, PG&E determined that the gates at Scott Dam would not be used to impound water above the spillway elevation, reducing the water storage capacity by approximately 16,623 AF (PG&E 2024). About 12 mi. downstream of Scott Dam is Van Arsdale Reservoir, which has a capacity less than 390 AF (PG&E 2006, 2015) and serves as a forebay to the Potter Valley Powerhouse.

At Van Arsdale Reservoir, the water that is diverted to the Potter Valley Powerhouse is conveyed south by a series of tunnels, conduits, and penstocks, while water remaining in the Eel River is released from, or spills over, Cape Horn Dam, where it flows northwest approximately 150 mi. to the Pacific Ocean. Releases made at Scott and Cape Horn dams support salmon and steelhead populations in the upper Eel River Watershed.

The Potter Valley Powerhouse is in the upper East Branch Russian River Watershed, and diversions from the Project are a significant source of water in the East Branch Russian River and for local water users (e.g., the Potter Valley Irrigation District [PVID]). Water from the Potter Valley Powerhouse and East Branch Russian River is impounded at the U.S. Army Corps of Engineers' (USACE's) Coyote Dam (Lake Mendocino). Lake Mendocino is operated and managed by USACE for the purposes of flood control and water supply, in coordination with the

Sonoma County Water Agency and Mendocino County Russian River Flood Control and Water Conservation Improvement District.

3.3.1.3 Drainage Area

Major features (dams, reservoirs, and diversion facilities) of the Project are located on the Eel River, a coastal river in Northern California that flows through Lake, Mendocino, Trinity, and Humboldt counties. The headwaters of the Eel River originate on the slopes of Bald Mountain (6,739 feet [ft.]) in eastern Mendocino County. The Eel River basin is composed almost entirely of low-elevation mountainous country and is, for the most part, undeveloped. Only approximately 7 square mi. (mi.^{2}) (around 2 percent) of the Lake Pillsbury basin is above 6,000 ft. in elevation. The Eel River drainage area is approximately 3,684 mi.^{2}. The drainage area upstream of Cape Horn Dam is approximately 349 mi.^{2}, and the drainage area upstream of Scott Dam is 290 mi.^{2}. The drainage area of the East Branch Russian River upstream of Lake Mendocino and Cold Creek is approximately 73 mi.^{2}.

3.3.1.4 Climate and Precipitation

The Project is in the Northern California coastal mountains, which normally have foggy summers and mild, wet winters. However, the climate in the Project vicinity is more representative of an interior region where summer temperatures can reach over 100 degrees Fahrenheit (°F). Rainfall in the upper Eel River drainage is variable. Approximately 75 percent of the precipitation occurs in the form of rain between November and March. Snow occurs in some areas of higher elevation. The mean annual precipitation ranges from approximately 40 inches (in.) at Lake Pillsbury to approximately 70 in. near Bald Mountain.

3.3.1.5 Runoff

Total annual unimpaired runoff at selected locations along the Eel River is shown in Table 3.3.1-1.

Table 3.3.1-1. Average annual unimpaired flows in the Eel River, 1925-2023.

Location	Average Annual Unimpaired Flow
Eel River at Scott Dam	207,600 AF
Eel River at Cape Horn Dam	250,700 AF
Eel River above Middle Fork Eel River	524,400 AF
Eel River at Fort Seward	1,704,400 AF
Eel River at Scotia	2,796,300 AF

3.3.1.6 Air Temperature

Hourly air temperature data collected at Scott Dam (elevation of 1,807 ft.), from 2009 to present, show an average annual air temperature of 54.3°F, with the lowest temperature on record being 13°F and the highest being 110°F. Hourly air temperature data collected at the Potter Valley Powerhouse (elevation of 1,020 ft.), from 2009 to present, show an average annual temperature of 56.8°F, with the lowest temperature being 15°F and the highest being 113°F. Table 3.3.1-2 and Table 3.3.1-3 provide hourly minimum, maximum, and mean air temperatures for each month at Lake Pillsbury and Potter Valley Powerhouse, respectively.

Table 3.3.1-2. Hourly minimum, maximum, and mean air temperatures for each month in degrees Fahrenheit at Lake Pillsbury (2009–2023).

Temperatures Recorded at Lake Pillsbury (°F)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Min	14	20	23	27	31	36	45	42	34	27	17	13
Max	80	79	85	88	92	102	104	103	110	96	82	70
Mean	41	43	46	51	57	66	72	71	65	56	46	40

Table 3.3.1-3. Hourly minimum, maximum, and mean air temperatures for each month in degrees Fahrenheit at Potter Valley Powerhouse (2009–2023).

Temperatures Recorded at Potter Valley Powerhouse (°F)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Min	18	20	24	26	32	37	44	42	37	27	19	15
Max	79	81	88	92	103	109	112	111	113	101	89	76
Mean	45	46	49	54	60	68	74	72	67	58	48	43

3.3.1.7 Existing and Proposed Uses of Project Water

Existing uses of water passing through the Project Area include hydroelectric power production; agricultural, domestic, municipal, and industrial water supply; aquatic and wildlife habitats; and recreation. Regulatory flow requirements in the FERC license (FERC 1983 and 2004) and National Marine Fisheries Service's (NMFS') Reasonable and Prudent Alternative (RPA) (NMFS 2002) constrain Project operations and resulting uses of Project waters.

3.3.1.8 Hydroelectric Uses

The Potter Valley Powerhouse (9.2 megawatts) uses water diverted from the Eel River (up to 331 cubic feet per second [cfs]) at the Van Arsdale Intake for power generation. Since the summer of 2021, the powerhouse has not generated power due to a failed transformer. Three small hydroelectric projects are located downstream of Potter Valley Powerhouse on the East Branch Russian River. The three projects are BES Hydro (FERC Project No. 8936), McFadden Hydro, and Hammeken Hydro, with installed capacities of 400 kilowatts (kW), 330 kW, and 450 kW, respectively. The owners of these three small hydroelectric projects pay headwater benefit charges to PG&E as part of their power purchase agreements. A fourth hydroelectric project (Lake Mendocino Power Project) is located on the outlet conduit of Coyote Dam and operated by the city of Ukiah (it includes two units with an installed capacity of 1,000 kW and 2,500 kW).

3.3.1.9 Agricultural, Domestic, Municipal, and Industrial Water Supply Uses

Some of the water exiting the Potter Valley Powerhouse Tailrace is diverted to PVID, consistent with existing water purchase contract and regulatory flow requirements of the FERC Project license. PG&E has consumptive water rights associated with the Project to serve irrigation demands within the PVID place of use (SWRCB 2016).

Water downstream of Lake Mendocino is used for agriculture, domestic, municipal, and industrial purposes.

3.3.1.10 Aquatic and Wildlife Habitats

The Project supports a variety of aquatic and wildlife resources and habitats. Aquatic habitat in the vicinity of the Project includes coldwater stream habitat in the Eel River downstream of Scott Dam benefiting Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), and other native and introduced aquatic species and in the East Branch Russian River benefits resident rainbow trout and other native and introduced aquatic species. Releases from storage in Lake Mendocino support anadromous salmonids (Chinook salmon, coho salmon [*Oncorhynchus kisutch*], and steelhead) and other aquatic species in the Russian River. Lake Pillsbury provides reservoir habitat supporting both warm and coldwater aquatic species. Van Arsdale Reservoir does not provide reservoir habitat, as it has limited storage. It supports coldwater aquatic species similar to those found in the Eel River.

The riparian corridor and surrounding lands in the vicinity of the Project support a variety of plant and wildlife resources. The riparian corridor provides food; migration and dispersal corridors; and escape, nesting, and thermal cover for wildlife species. Information on aquatic, botanical, and wildlife resources in the Project vicinity is provided in Sections 3.3.3, 3.3.4, and 3.3.5, respectively.

3.3.1.11 Recreation

A variety of water-related Project recreation facilities are in the immediate vicinity of the Project. Information on recreation use at Project facilities is provided in Section 3.3.9.

3.3.1.12 Regulatory Flow Requirements

PG&E must comply with NMFS' RPA flow requirements as described in NMFS's 2002 Biological Opinion. However, because of seismic restrictions in 2023 that preclude using the Scott Dam gates for storing water and recent drought conditions, PG&E has been requesting and receiving temporary flow variances from FERC that include reduced flows. PG&E has submitted a license amendment that includes similar reduced flows. The RPA, variance, and proposed amendment flows are discussed below.

NMFS RPA Regulatory Flow Requirements

The regulated flow regime required by NMFS' RPA (Appendix B) for the Project, incorporated by amendment of the FERC Project license in 2004, requires flow releases for the protection of

Chinook salmon and steelhead populations. Project flow regimes have attempted to mimic the pattern and timing of the natural hydrograph in the upper Eel River Watershed since 1979. The RPA flow regime reflects a modification of these earlier regimes based on the results of monitoring studies and water modeling efforts. Minimum flows are specified in the RPA for three distinct locations: the Eel River below Scott Dam, Eel River below Cape Horn Dam, and East Branch Russian River below Potter Valley Powerhouse. Additionally, the RPA specifies allowable diversions for irrigation by PVID. The RPA flow requirements described in this section are based on descriptions provided in NMFS' RPA and in the Eel River Action Plan (Eel River Forum 2016).

Eel River

Minimum flow requirements in the Eel River below Scott Dam are specified in Section B of the RPA (Appendix B). These minimum flows range from 20 to 60 cfs between June 1 and November 30 and range from 20 to 100 cfs between December 1 and May 31 depending on water year classification.[1] Releases near the bottom of Lake Pillsbury provide coldwater in the 12-mi.-long reach between the Project dams from late spring through fall, which help sustain high-quality rearing habitat for juvenile Chinook salmon and steelhead. However, the coldwater releases can delay juvenile outmigration, exposing migrating fish to inhospitable water temperatures in the lower Eel River. PG&E, the California Department of Fish and Wildlife, and NMFS have experimented with required "block water" and "warm surface water" flow release strategies to encourage timely juvenile outmigration.

Minimum flow requirements in the Eel River below Cape Horn Dam are specified in Section A of the RPA (Appendix B). They are simple in concept, although the actual mathematical computation is more complicated. The goal of the minimum flow requirements is to mimic the pattern and timing of the natural hydrograph. Flow releases during the fall, winter, and spring are determined on a daily basis by calculating the unimpaired flow of the Eel River below Cape Horn Dam (in AF), converting this daily volume into a 7-day running average flow rate (in cfs) to serve as a "smoothed" estimate of unimpaired flow, and then using this unimpaired flow estimate to compute an "index flow." The index flow is 70 percent of the unimpaired flow estimate at Cape Horn Dam, or "0.7 * Eel Unimpaired Flow." The RPA established lower and upper flow thresholds termed "floor" and "cap" that are applied to the index flow to determine the required minimum flow (Figure 3.3.1-1). Three rules are followed to compute the minimum flow requirement: (1) if the index flow is below the floor, the minimum flow requirement is equivalent to the floor; (2) if the index flow is between the floor and the cap, the minimum flow requirement is equivalent to the index flow; and (3) if the index flow is above the cap, the minimum flow requirement is equivalent to the cap. The resulting minimum flow requirements based on the floor and cap values also depend on antecedent conditions and the overall water year type; these flows are summarized in Section 5 (pp. 98–99) and in Table 8 (p. 99) of the NMFS Biological Opinion (NMFS 2002), as follows:

- **October 1 to November 30:** From October 1 to October 15, the cap is linearly increasing from a value equal to the previous "summer flow" (defined below) on September 30 to

[1] The actual releases from Scott Dam are generally substantially higher than the minimum flows due to the required releases for downstream compliance points on the Eel and Russian rivers and for deliveries to PVID.

140 cfs on October 15. The floor is linearly increasing from a value equal to the previous "summer flow" on September 30 to the fall floor flow on October 15. The fall floor is equal to 25 cfs or the previous "summer flow" on September 30, whichever is greater. From October 16 to November 30, the cap is 140 cfs, and the floor is equal to the fall floor defined above.

- **December 1 to March 30:** The cap is 140 cfs. The floor is 100 cfs except when the cumulative inflow into Lake Pillsbury is exceptionally low and the previous month's floor was not equal to 100 cfs, in which case the floor is 25 cfs.
- **April 1 to May 15:** The cap is 200 cfs. The floor is 100 cfs except when the cumulative inflow into Lake Pillsbury is exceptionally low and the previous month's floor was not equal to 100 cfs, in which case the floor is 25 cfs.
- **May 16 to July 30:** The cap remains constant at 200 cfs from May 16 through May 31 and then exponentially decreases from 200 cfs to the "summer flow" on August 1. The floor is exponentially decreasing from its value on May 15 to the "summer flow" on August 1.
- **August 1 to September 30:** The cap and the floor are both equal to the "summer flow."

The "summer flow" is the minimum flow requirement established for the August–September period by the RPA and is dependent on current and previous water year classifications. The "summer flow" can range from 3 cfs during Very Dry water years to 35 cfs in successive Very Wet water years. "Summer flow" requirements were established to approximate unimpaired flows.

East Branch Russian River

Minimum flow requirements in the East Branch Russian River below the powerhouse are specified in Section C of the RPA (Appendix B). These minimum flows range from 5 to 75 cfs between May 15 and September 15 and range from 5 to 35 cfs between September 16 and May 14 depending on water year classification.

Releases for PVID are specified in Section E.4 of the RPA. These releases are subject to a flow cap. During the growing season, defined as April 15 to October 15, the maximum release to PVID is 50 cfs. During the rest of the year, the maximum release to PVID is 5 cfs. Brief exceptions to this flow cap are allowed for frost protection purposes during the period of March 15 through April 15 and for post-harvest water during the period of October 16-31.

As specified in Section E.5 of the RPA, diversions from the Eel River to the East Branch Russian River are limited to the amounts set out in the RPA when Lake Pillsbury storage is below a particular threshold, which changes daily. The storage thresholds for limiting diversions are referred to as the Target Storage Curve (Figure 3.3.1-2). When Lake Pillsbury's storage exceeds the Target Storage Curve value on a given day, PG&E can divert water above the minimum releases to the East Branch Russian River plus PVID's allotment. However, when Lake Pillsbury's storage is below the Target Storage Curve, PG&E's diversion is capped at making the minimum releases to the East Branch Russian River and delivering PVID's required allotment. To ensure that every possible effort was made to maximize storage during the important pre-dry-season period, Target Storage Curve values were set at levels higher than can be attained during the spring.

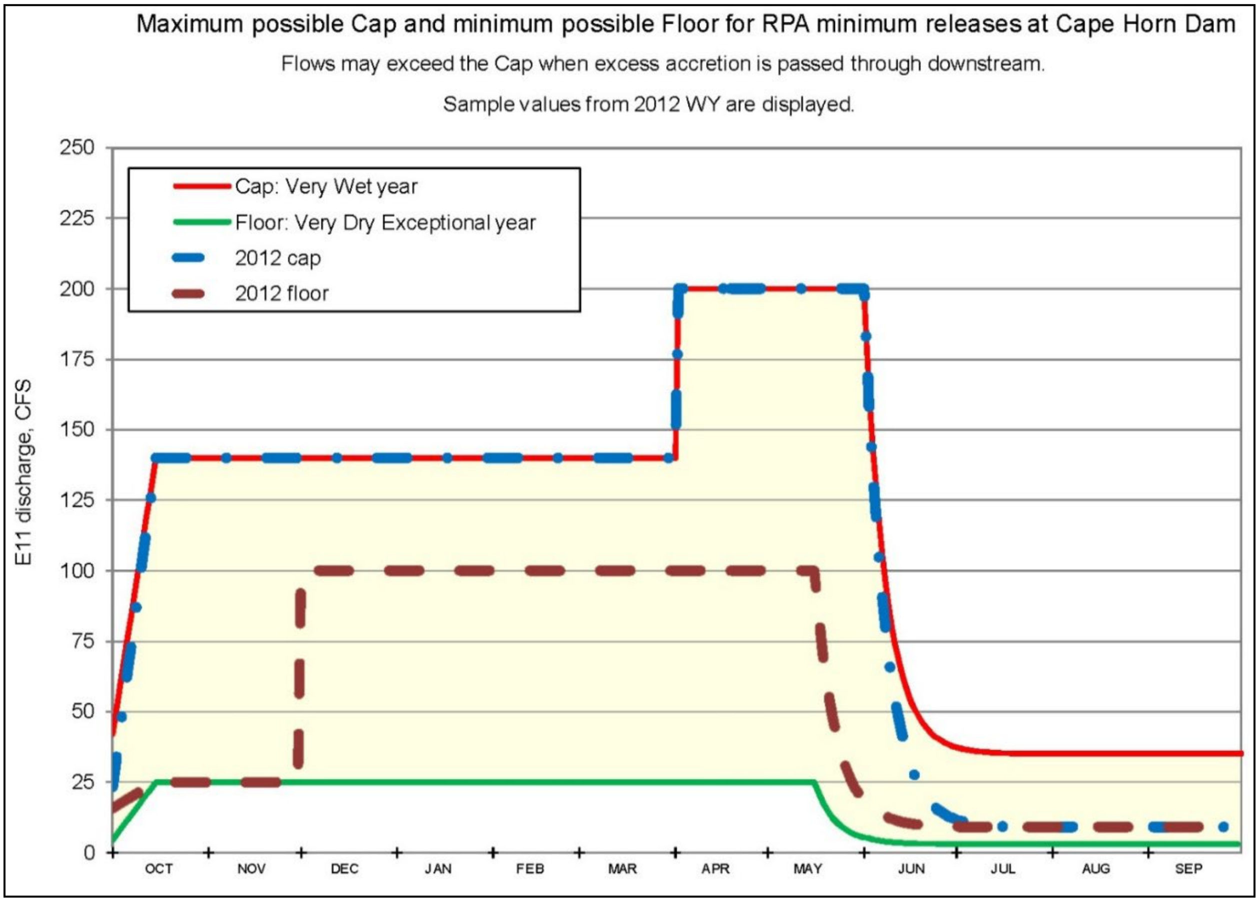
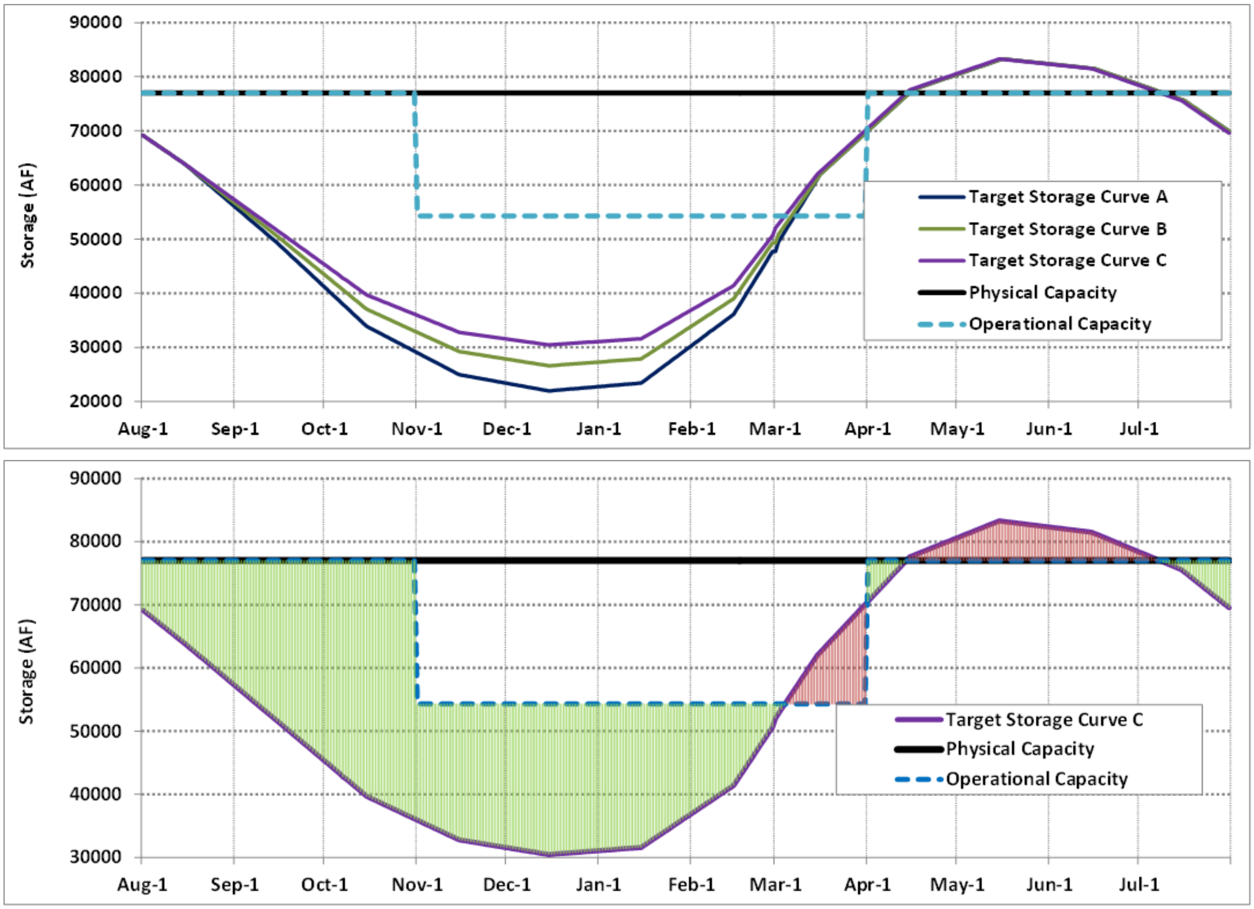


Figure 3.3.1-1. RPA minimum flow release requirements (cap and floor) and actual cap and floor for water year 2012 below Cape Horn Dam.



Note: The upper graph shows the three water year type curves (A = Very Wet, B = Wet-Dry, C = Very Dry) relative to reservoir capacity and seasonal operational capacity. The lower graph indicates when the reservoir storage can potentially be above the curve (green bars), allowing additional diversions to the powerhouse, and when the reservoir is constrained to be below the curve (red bars), limiting diversions to the required amount.

Figure 3.3.1-2. Target storage curves for Lake Pillsbury and implications for Project diversions.

It should be noted that following issuance of the Amended FERC license in January 2004, PG&E initially diverted more water during the spring period than was technically allowed by the rule curve exceptions clause in Section E.5 of the RPA. PG&E made diversions from 2004 through 2006 based on protocols agreed to by the Department of the Interior (DOI) and FERC (Oak Ridge National Laboratory) hydrologic modelers during the license amendment process.[2] These protocols allowed diversions exceeding minimum releases to the East Branch Russian River plus PVID's allotment when Lake Pillsbury storage was below the Target Storage Curve so long as minimum flow requirements (including block flow releases) were being met in the Eel River below Cape Horn Dam and additional water was available at the diversion due to spillage from Lake Pillsbury and/or accretion between the two dams. During the license amendment process, all modeling of impacts on water supply and aquatic resources for each proposed flow schedule evaluated and incorporated this flexibility. However, the literal wording of the Section E.5

[2] DOI/NMFS/Oak Ridge National Laboratory Eel River model documentation and operating code.

exception clause of the final RPA failed to reflect this flexibility. After this issue was identified by the resource agencies, PG&E began operating the Project per literal interpretation of Section E.5 beginning in 2007.

Temporary Flow Variance Flow Requirements

In 2023 and 2024, PG&E requested the ability to do a flexible management release strategy to maintain water temperature in the Eel River with the limited storage available in Lake Pillsbury due to seismic restrictions. The following flow variance conditions were requested and approved by FERC for 2024:

- Gaging Station E-2 will be reclassified as a Critical Water Year Type. In practice, the E-2 flows will be the combined releases for E-11, E-16, and PVID contract water, with a floor set by the minimum opening of the low-level outlet (approximately 35 cfs) (see Table 3.3.1-4).
- Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs) and then will be adjusted between 5 and 25 cfs based on PG&E and agency determination when daily average reservoir release water temperatures at E-2 exceed 15 degrees Celsius (°C) (E-2 water temperatures typically exceed 15°C in early June).
- After September 30, E-16 will be held at 25 cfs for the remainder of the variance.
- Reductions to E-16 flow releases may also occur if the Lake Pillsbury storage forecast indicates facility safety concerns due to low storage levels (12,000 AF).
- The Drought Working Group will meet once monthly during the variance period to discuss storage levels, release flow rates, water temperature profiles, release temperatures, and estimated temperature projections at E-2.
- PG&E will submit monthly water storage and temperature reports to FERC.
- The drought variance will end when Lake Pillsbury storage exceeds 36,000 AF after October 1, 2024, or is superseded by another variance or license amendment. The 36,000 AF storage threshold would allow the reservoir to meet minimum flow obligations, including a possible block water release, through January 2025 if inflow is extremely low in early winter.
- Flows will be calculated at a 24-hour average measured at Gaging Station E-11 rather than the current instantaneous measurement. This will allow for a tighter compliance buffer on minimum E-11 flows.

Table 3.3.1-4. Requested flows under PG&E's 2024 flow variance.

Compliance Point	Allowed Range: Min/Max	Water Year Classification	Notes
Eel River below Scott Dam (E-2)	20 cfs*/No max	Critical	Adjusted RPA minimum flow classification to critical
Eel River below Cape Horn Dam (E-11)	TBD**/No max	TBD**	No change from RPA
East Branch Russian River (E-16)	5 to 25 cfs	Critical or Dry	Adjusted RPA minimum flow classification to critical or dry
Potter Valley Irrigation District	No min/50 cfs*** (5 cfs post-irrigation season)	N/A	PG&E's discretion to meet temperature, storage and facility safety objectives

Note: cfs = cubic feet per second; TBD = to be determined on May 15.
* In practice, assumed 35 cfs based on low level outlet minimum release (facility limitation)
** Water Year Type for E-11 determined May 15 of each year.
*** Demand based deliveries to PVID are secondary to storage, temperature and facility safety objectives.

Proposed Amendment Flow Requirements

The proposed amendment flows for the Eel River and East Branch Russian River are as follows:

- Compliance is defined as mean daily flow
- East Branch Russian River minimum flows:
  - Oct. 1–Apr. 14 depends on water year classification only (RPA flows):
    - Normal and Dry: 35 cfs
    - Critical: 5 cfs
  - Apr. 15–June 30 depends on water year classification and spill condition:
    - When Lake Pillsbury is above 1,900.0 ft. (spilling; RPA flows):
      - Normal: 35 cfs through May 14, 75 cfs May 15–June 30
      - Dry: 25 cfs
      - Critical: 5 cfs
    - When Lake Pillsbury is at or below 1,900.0 ft. (not spilling):
      - 5 cfs
  - July 1–Sep. 30:
    - 5 cfs
- E-2 minimum instream flow set at the "Critical WY type" requirement
- Keep E-11 flows as described in the RPA

3.3.1.13 Water Rights

PG&E holds water rights for both power and consumptive uses. Water is diverted from the Eel River for generation at Potter Valley Powerhouse in the East Branch Russian River Watershed. After passing through the Potter Valley Powerhouse, a portion of the powerhouse outflow is diverted via canals to PVID for consumptive use. The remaining outflow is abandoned to the East Branch Russian River. This abandoned water from powerhouse operations adds significant inflow to Lake Mendocino and benefits downstream users.

PG&E has three licensed water rights for the Project diversions and two pre-1914 water rights (Table 3.3.1-5). License 1424, with a priority date of March 12, 1920, allows PG&E to divert and store up to 102,366 AF per annum (AFA) at Lake Pillsbury for the beneficial uses of hydropower generation and incidental fish and wildlife protection and enhancement. License 1199, with a priority date of August 15, 1927, allows PG&E to divert and store up to 4,500 AFA at Lake Pillsbury for irrigation purposes within the PVID service area. License 5545, with a priority date of March 11, 1930, allows PG&E to divert to storage up to 4,908 AFA of water at Lake Pillsbury and to directly divert up to 40 cfs from the Eel River for irrigation purposes within the PVID service area in the Russian River Watershed.

PG&E claims a pre-1914 water right to directly divert up to 340 cfs from the Eel River, as specified in Statement of Water Diversion and Use (SWDU) 1010, for power generation and irrigation use. PG&E also claims a pre-1914 water right to store up to 1,457 AFA in Van Arsdale Reservoir, as specified in SWDU 4704, for power, irrigation, and domestic use.

3.3.1.14 Water Supply Agreement

PG&E has a contract to sell and deliver water to PVID at the tailrace of the Potter Valley Powerhouse. PG&E's obligation under the current contract[3] is to deliver up to 19,000 AF of water to PVID at a rate not to exceed 50 cfs, provided the water is available and permitted per PG&E's applicable water rights.

[3] Original PVID contract dated March 30, 1936, subsequently amended May 1, 1939, and October 15, 2014.

Table 3.3.1-5 Summary of existing water rights.

Appl. No.	License / Permit No.	SWDU No.	Priority / First Use	Gage	Storage (AFA)	Direct Diversion (cfs)	Season Begin	Season End	Description (Name of Works)	Point of Diversion	Place of Use	Type of Use	Water Right Class
1719	1424	–	03/12/1920	E-1	102,366	–	Nov 1	June 1	Lake Pillsbury (Scott Dam)	Eel River	Potter Valley Powerhouse	P, FWL	License
5661	1199	–	08/15/1927	E-1	4,500	–	Nov 1	Apr 30	Lake Pillsbury (Scott Dam)	Eel River	PVID	I	License
6594	5545	–	03/11/1930	E-1	4,908	–	Nov 1	June 1	Scott Dam	Eel River	PVID	I	License
				E-C6	–	40	May 1	Oct 31	Cape Horn Dam				
–	–	1010	1905	E-16	–	340	–	–	Potter Valley Powerhouse Diversion	Eel River	Potter Valley Powerhouse	P, I	Pre-1914
–	–	4704	1907	E-3	1,457	–	–	–	Van Arsdale	Eel River	Potter Valley Powerhouse and PVID	P, I, D	Pre-1914

Notes:
D = domestic
FWL = fish and wildlife
I = irrigation
P = power

3.3.1.15 Hydrology

Existing Stream and Reservoir Gages

PG&E currently maintains a network of stream, powerhouse, and reservoir gaging stations in the watershed to monitor and record the storage and flow of water throughout the Project. This network consists of one gage that measures reservoir elevation at Lake Pillsbury, three gages that measure diversion flows, two calculated diversion gages, and two gages that measure river flows below Scott and Cape Horn dams. Additionally, the USGS maintains two stream gaging stations on the Eel River downstream of the Project and one stream gaging station on the East Branch Russian River downstream of the Project. Gaging stations used in the hydrology analysis are shown in Table 3.3.1-6.

Table 3.3.1-6. Gaging stations used in the hydrology analysis.

PG&E Name	USGS No.	USGS Name	Purpose
Reservoir Gage			
E-1	11470000	Lk Pillsbury NR Potter Valley CA	Measures Lake Pillsbury reservoir elevation
Diversion Gages			
E-5	11471105	Potter Valley Irrig CN E5 NR Potter Valley CA	Measures diversion to the PVID East Canal
E-6	11471106	Potter Valley Irrig CN E6 NR Potter Valley CA	Measures diversion to the PVID West Canal
E-16	11471000	Potter Valley PH Intake near Potter Valley CA	Meter at the Penstock No. 1 Butterfly Valve House measures flows from the Eel River to the Potter Valley Powerhouse
River Gages			
E-2	11470500	Eel R BL Scott Dam NR Potter Valley CA	Measures flow in the Eel River downstream of Scott Dam
E-11	11471500	Eel R Van Arsdale Dam NR Potter Valley CA	Measures flow in the Eel River downstream of Cape Horn Dam
N/A	11475000	Eel River nr Fort Seward CA	Measures flow in the Eel River downstream of the confluence with the North Fork Eel River
N/A	11477000	Eel River nr Scotia CA	Measures flow in the Eel River near the town of Scotia
N/A	11461500	EF Russian R nr Calpella CA	Measures flow in the East Branch Russian River upstream of Lake Mendocino

Gaging Period of Record

Flow records collected by stream gages within the Potter Valley Project area span the period from 1910 to the present. Each stream gage in the Project Area has a different period of record. The full period of record was used for the statistical analysis of each stream gage.

Calculated Impaired and Unimpaired Stream Flows

Impaired and unimpaired stream flows were analyzed at locations in the Project area where sufficient gage data exists. Impaired stream flows are directly gaged. Unimpaired stream flow in the Eel River at Scott Dam was calculated using a mass balance approach where inflow equals the change in storage plus releases plus evaporation. Accretions along the Eel River were calculated by subtracting the upstream stream gage from the downstream stream gage in a given reach. Unimpaired flows in the Eel River from Cape Horn Dam to the Eel River nr Scotia CA stream gage (USGS gage no. 11477000) were calculated by adding the calculated accretions to the unimpaired flow at the location upstream. Unimpaired flow in the Potter Valley Powerhouse was assumed to be zero.

The mean, minimum, and maximum monthly average impaired and unimpaired flows in the Eel River at Scott Dam are summarized in Table 3.3.1-7. A hydrograph of monthly average flow over the past 10 years is shown on Figure 3.3.1-3. Flow duration curves of impaired and unimpaired flows in the Eel River at Scott Dam are shown on Figure 3.3.1-4. Flood flow frequency values are shown in Table 3.3.1-8.

Table 3.3.1-7. Monthly mean, minimum, and maximum flows (in cfs) in the Eel River at Scott Dam.

	Eel River below Scott Dam					
	Unimpaired 1925–2023			Impaired 1925–2023		
Month	Mean	Minimum	Maximum	Mean	Minimum	Maximum
October	58	0	669	199	19	361
November	275	0	2,484	251	13	1,851
December	976	15	5,472	772	28	4,945
January	1,435	24	5,714	1,287	36	5,687
February	1,537	88	6,586	1,396	7	6,625
March	1,220	110	4,528	1,083	12	4,536
April	795	71	3,249	676	15	3,357
May	369	44	1,323	359	34	1,328
June	132	20	707	200	50	717
July	38	2	122	167	51	329
August	17	0	56	168	52	334
September	19	0	53	193	34	336

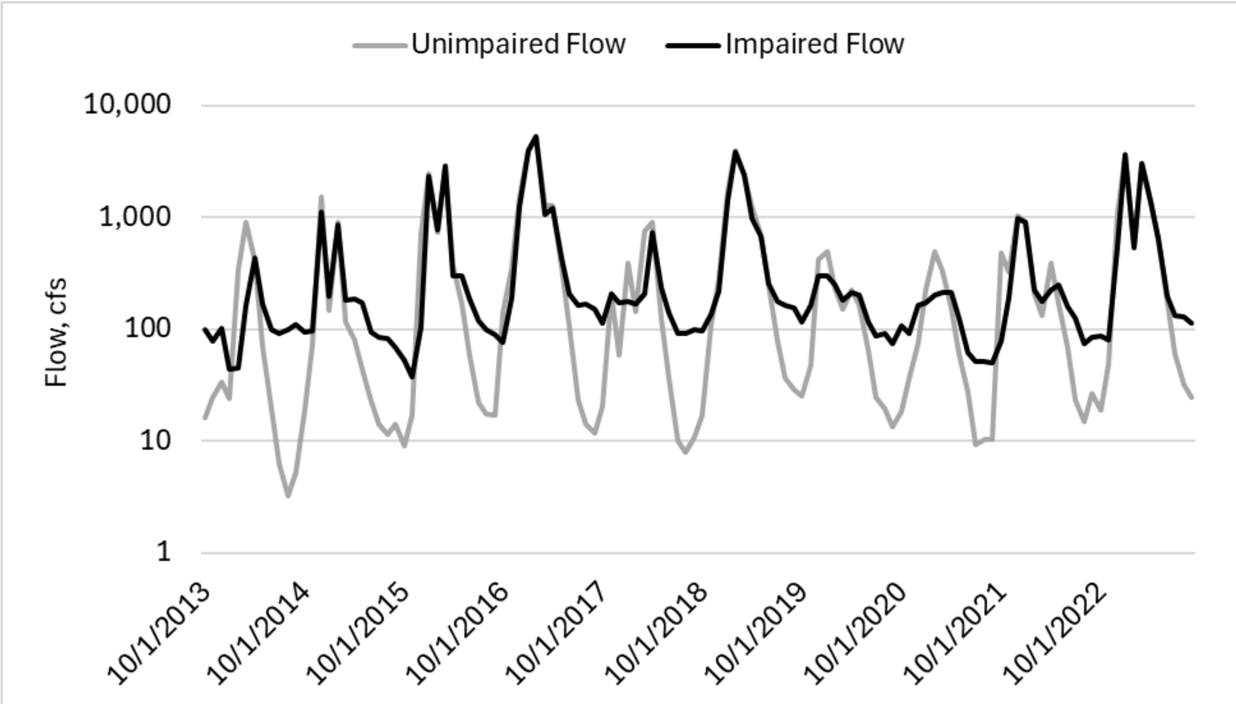


Figure 3.3.1-3. Eel River below Scott Dam monthly average flow, water years 2014–2023.

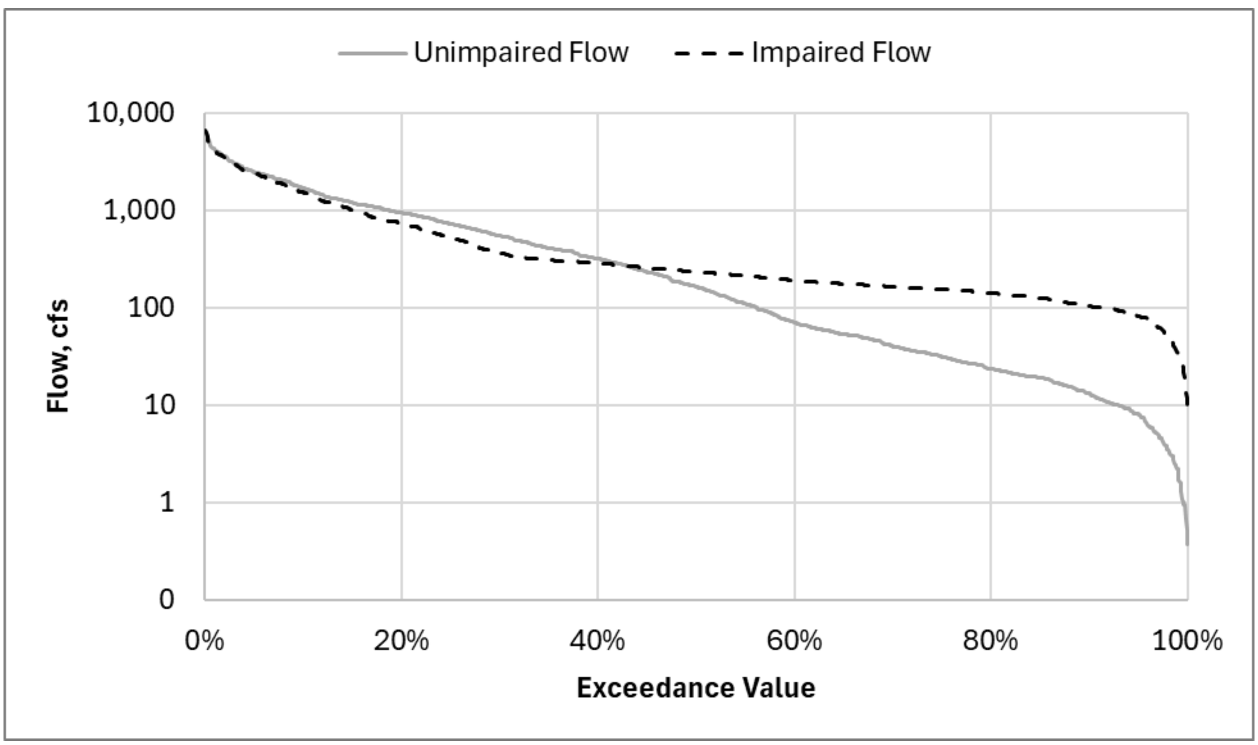


Figure 3.3.1-4. Eel River below Scott Dam monthly average flow duration curve, water years 1925–2023.

Table 3.3.1-8. Flood frequency flows (in cfs) in the Eel River at Scott Dam, water years 1925–2023.

Return Interval	Unimpaired Flow, cfs	Impaired Flow, cfs
100-year	47,469	45,300
50-year	36,746	33,900
20-year	29,119	29,400
10-year	24,332	24,700
5-year	19,085	16,500
2-year	10,242	7,420
1-year	505	304

The mean, minimum, and maximum monthly average impaired and unimpaired flows in the Eel River at Cape Horn Dam are summarized in Table 3.3.1-9. A hydrograph of monthly average flow over the past 10 years is shown on Figure 3.3.1-5. Flow duration curves of impaired and unimpaired flows in the Eel River at Cape Horn Dam are shown on Figure 3.3.1-6. Flood flow frequency values are shown in Table 3.3.1-10.

Table 3.3.1-9. Monthly mean, minimum and maximum flows (in cfs) in the Eel River at Cape Horn Dam.

	Eel River below Cape Horn Dam					
	Unimpaired 1912–2023			Impaired 1912–2023		
Month	Mean	Minimum	Maximum	Mean	Minimum	Maximum
October	63	0	813	187	6	438
November	326	0	3,063	299	19	2,419
December	1,132	18	6,031	909	29	5,504
January	1,728	28	6,762	1,577	43	6,751
February	1,867	44	9,117	1,706	15	9,156
March	1,427	77	5,679	1,276	34	5,809
April	933	62	4,118	801	22	4,186
May	432	52	1,648	415	42	1,490
June	152	15	776	209	41	689
July	43	1	133	161	13	318
August	19	0	68	157	5	322
September	20	0	65	176	5	317

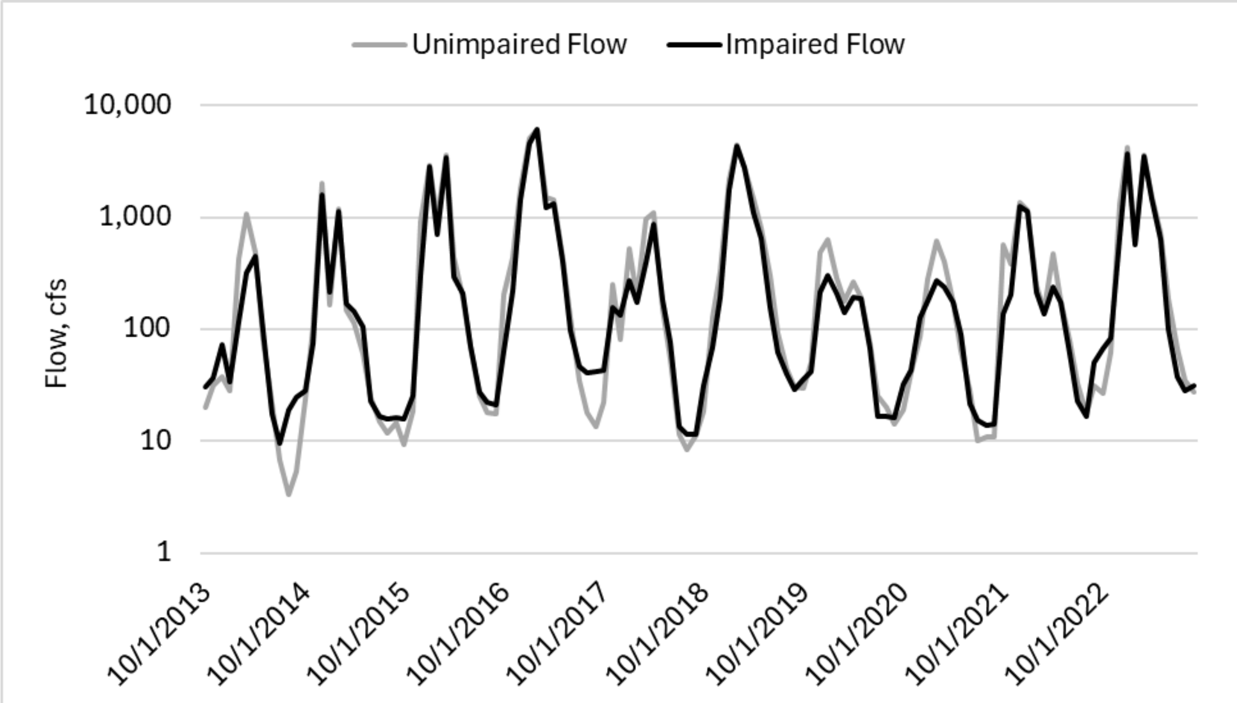


Figure 3.3.1-5. Eel River below Cape Horn Dam monthly average flow, water years 2014–2023.

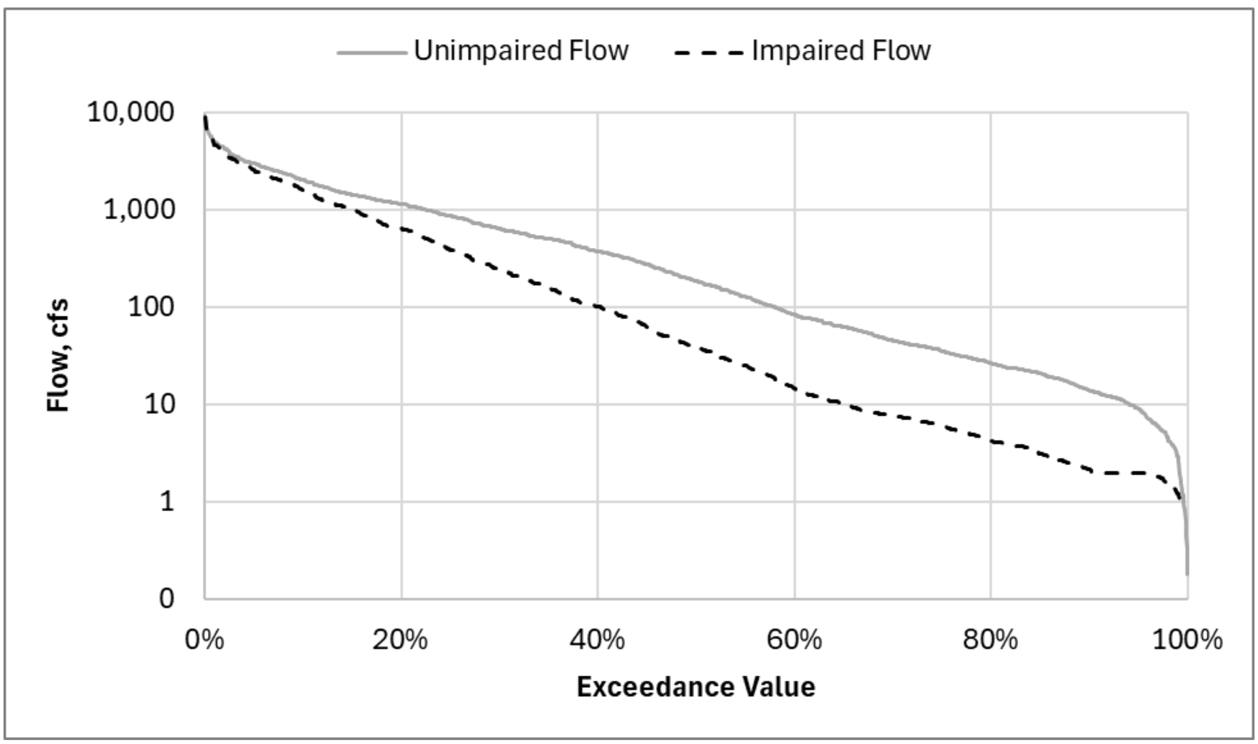


Figure 3.3.1-6. Eel River below Cape Horn Dam monthly average flow duration curve, water years 1912–2023.

Table 3.3.1-10. Flood frequency flows (in cfs) in the Eel River at Cape Horn Dam, water years 1912–2023.

Return Interval	Unimpaired Flow, cfs	Impaired Flow, cfs
100-year	52,256	50,087
50-year	49,081	46,235
20-year	34,586	34,737
10-year	28,878	27,478
5-year	24,175	19,149
2-year	12,221	8,962
1-year	612	307

The mean, minimum, and maximum monthly average impaired and unimpaired flows in the Eel River at the Fort Seward stream gage are summarized in Table 3.3.1-11. A hydrograph of monthly average flow over the past 10 years is shown on Figure 3.3.1-7. Flow duration curves of impaired and unimpaired flows in the Eel River at the Fort Seward stream gage are shown on Figure 3.3.1-8. Flood flow frequency values are shown in Table 3.3.1-12.

Table 3.3.1-11. Monthly mean, minimum, and maximum flows (in cfs) in the Eel River at Fort Seward, California.

	Eel River near Fort Seward, CA					
	Unimpaired 1956–2023			Impaired 1956–2023		
Month	Mean	Minimum	Maximum	Mean	Minimum	Maximum
October	486	13	7,004	430	19	6344
November	2,839	78	23,542	2,620	84	22,810
December	9,595	112	55,266	9,114	90	54,474
January	12,910	111	44,638	12,463	117	44,298
February	12,193	634	47,801	11,744	528	47,539
March	10,282	721	31,164	9,800	583	30,775
April	5,982	623	23,297	5,575	547	23,075
May	2,753	301	10,546	2,532	349	10,184
June	875	96	4,715	775	92	4,470
July	207	20	627	177	22	562
August	78	4	241	71	12	205
September	81	11	446	70	8	413

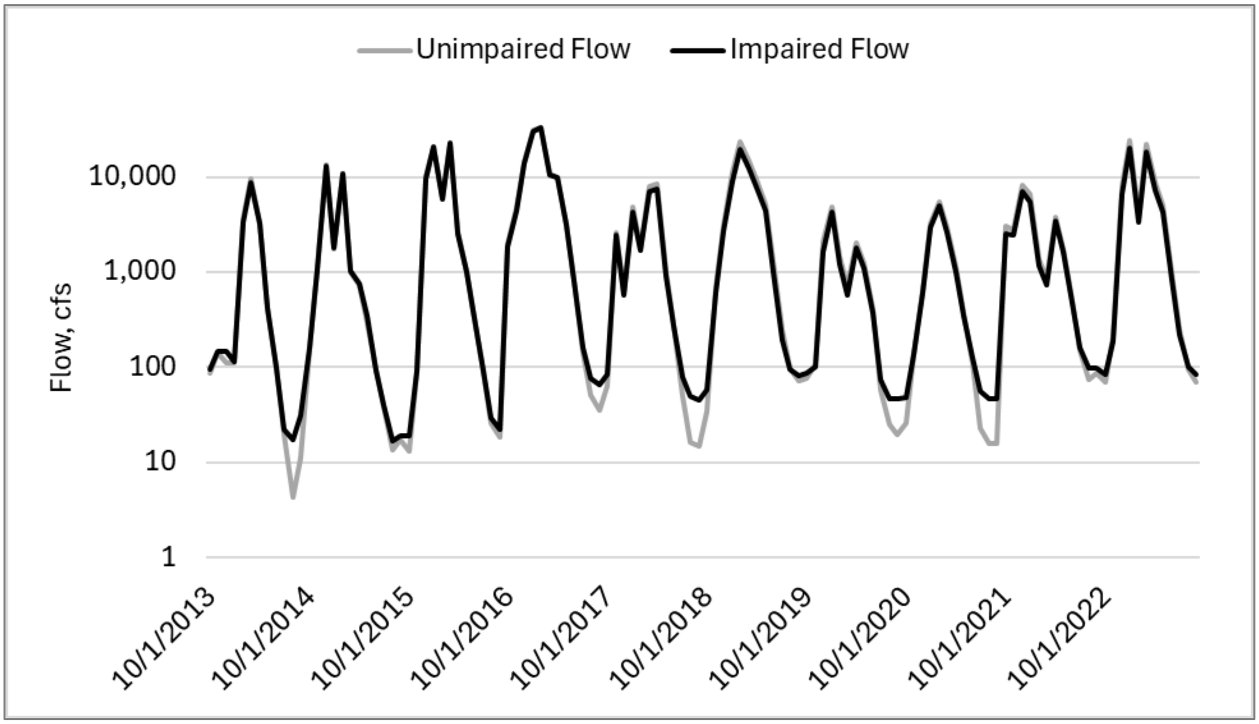


Figure 3.3.1-7. Eel River at Fort Seward stream gage monthly average flow, water years 2014–2023.

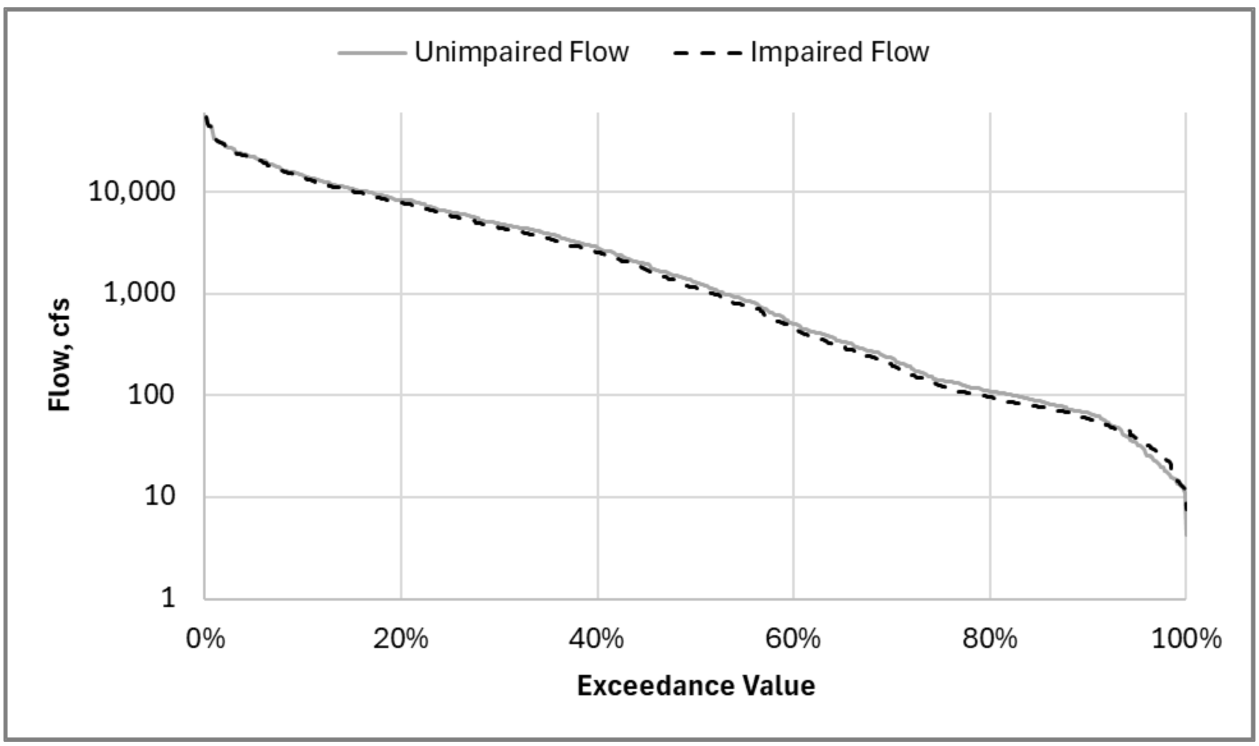


Figure 3.3.1-8. Eel River at Fort Seward stream gage monthly average flow duration curve, water years 1956–2023.

Table 3.3.1-12. Flood frequency flows (in cfs) in the Eel River at Fort Seward stream gage, water years 1956–2023.

Return Interval	Unimpaired Flow, cfs	Impaired Flow, cfs
100-year	443,951	433,125
50-year	302,106	297,965
20-year	228,364	218,930
10-year	160,306	162,159
5-year	125,398	122,027
2-year	74,988	70,567
1-year	2,777	2,587

The mean, minimum, and maximum monthly average impaired and unimpaired flows in the Eel River at Scotia, California, are summarized in Table 3.3.1-13. A hydrograph of monthly average flow over the past 10 years is shown on Figure 3.3.1-9. Flow duration curves of impaired and unimpaired flows in the Eel River at Scotia, California, are shown on Figure 3.3.1-10. Flood flow frequency values are shown in Table 3.3.1-14.

Table 3.3.1-13. Monthly mean, minimum, and maximum flows (in cfs) in the Eel River at Scotia, California.

Month	Eel River at Scotia, California					
	Unimpaired 1912–2023			Impaired 1912–2023		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
October	724	40	12,142	677	46	11,482
November	4,732	53	40,492	4,523	59	39,760
December	14,664	200	87,325	14,225	171	86,533
January	19,870	196	71,138	19,455	202	70,797
February	19,812	431	79,275	19,377	389	79,013
March	15,181	1,022	52,200	14,746	946	51,811
April	9,456	762	39,527	9,081	703	39,305
May	4,147	333	22,623	3,919	278	22,367
June	1,436	99	7,744	1,324	76	7,500
July	382	29	1,262	349	25	1,184
August	157	20	464	148	22	429
September	146	17	806	135	19	774

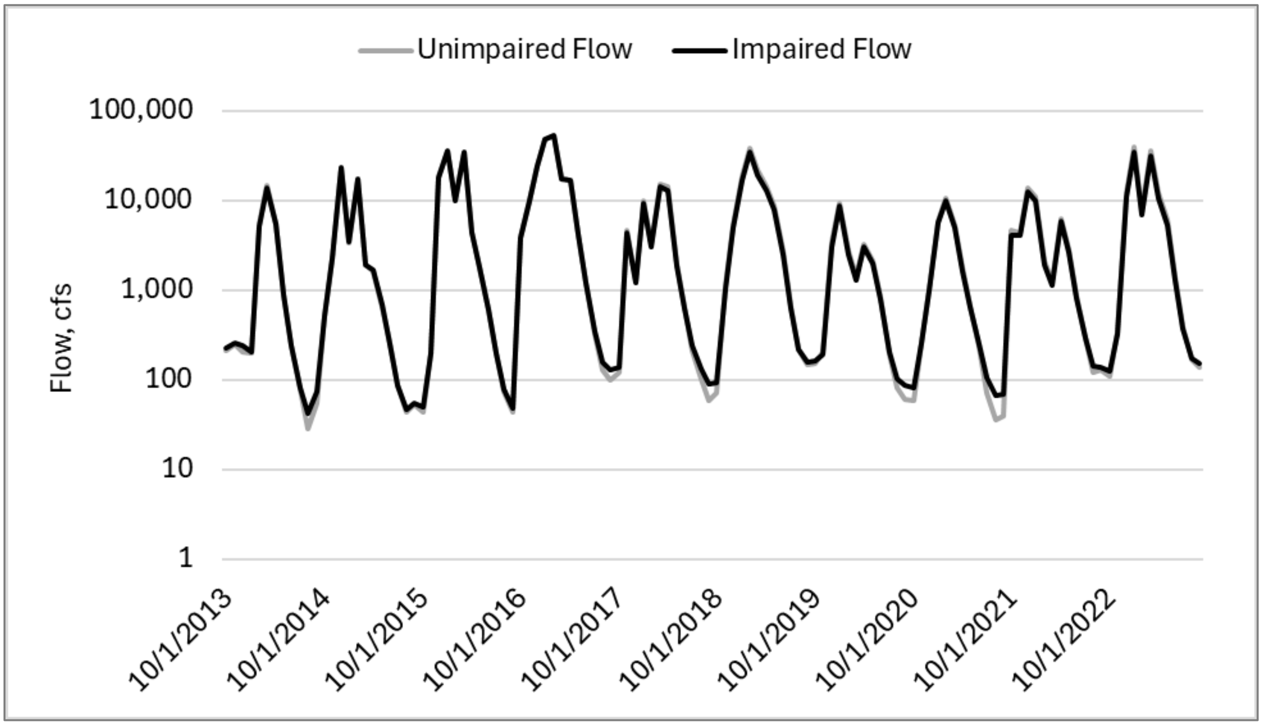


Figure 3.3.1-9. Eel River at Scotia, California, monthly average flow, water years 2014–2023.

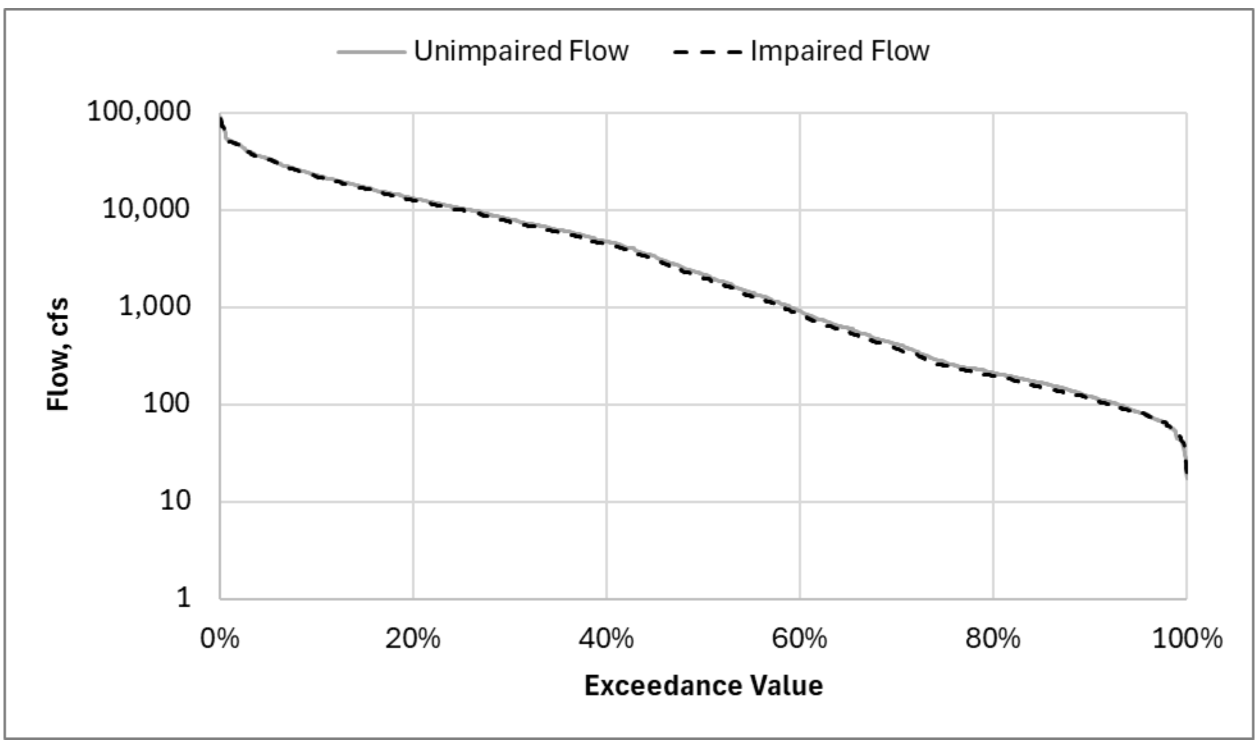


Figure 3.3.1-10. Eel River at Scotia stream gage flow duration curve, 1912–2023.

Table 3.3.1-14. Flood frequency flows (in cfs) in the Eel River at Scotia, California, water years 1912–2023.

Return Interval	Unimpaired Flow, cfs	Impaired Flow, cfs
100-year	606,910	596,084
50-year	473,799	469,658
20-year	319,768	310,412
10-year	257,911	262,568
5-year	206,745	205,066
2-year	123,845	118,561
1-year	5,701	5,542

The mean, minimum, and maximum monthly average flows in the Potter Valley Powerhouse Tailrace are summarized in Table 3.3.1-15. A hydrograph of monthly average flow over the past 10 years is shown on Figure 3.3.1-11. A flow duration curve of flows in the Potter Valley Powerhouse Tailrace is shown on Figure 3.3.1-12.

Table 3.3.1-15. Monthly mean, minimum, and maximum flows (in cfs) in the Potter Valley Powerhouse Tailrace.

	Potter Valley Powerhouse Tailrace*		
	Impaired 1912–2023		
Month	Mean	Minimum	Maximum
October	169	0	321
November	172	5	311
December	188	0	311
January	202	0	316
February	216	9	325
March	215	0	330
April	204	19	330
May	193	37	330
June	165	39	325
July	151	11	314
August	148	2	320
September	167	3	314

* Flows include water that is diverted for use by PVID.

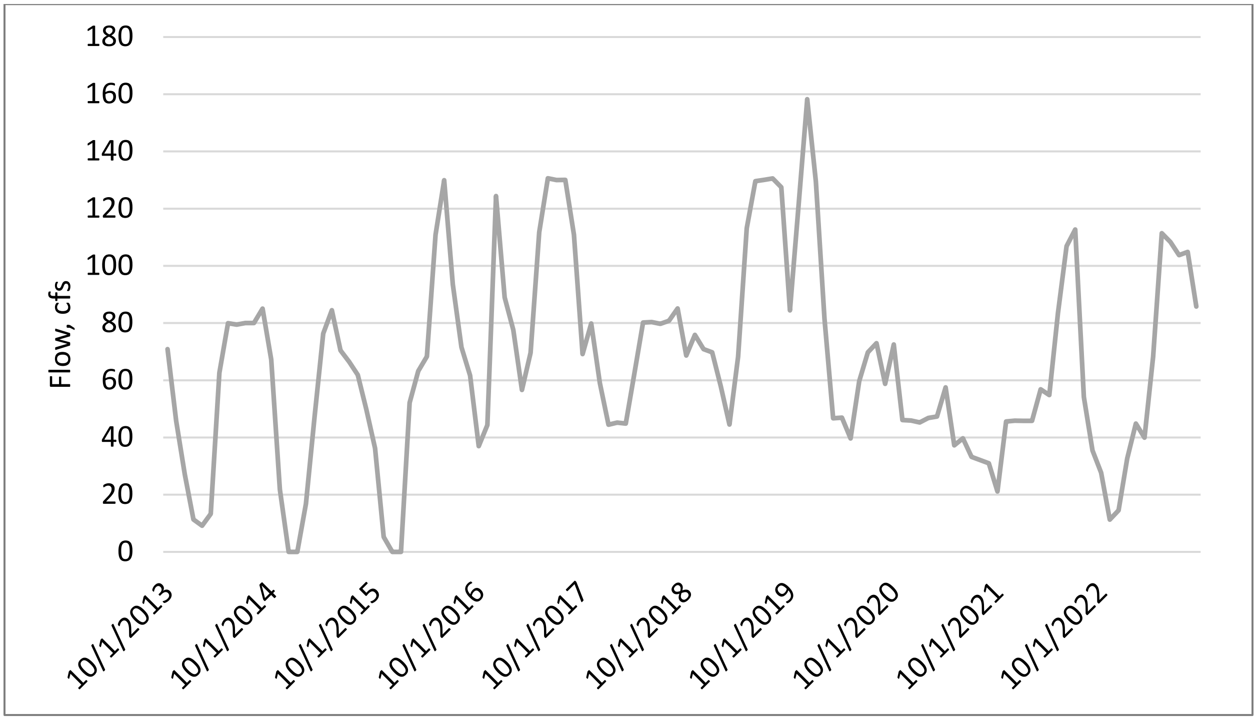


Figure 3.3.1-11. Potter Valley Powerhouse flow, water years 2014–2023.

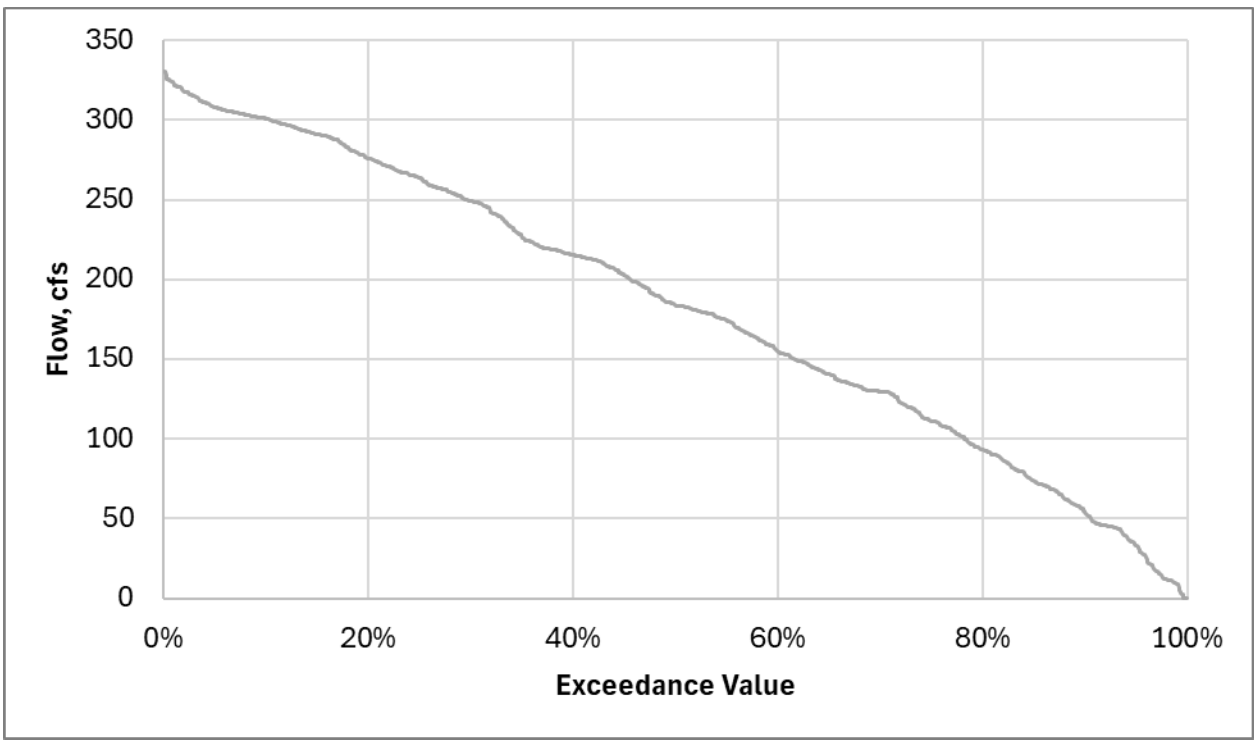


Figure 3.3.1-12. Potter Valley Powerhouse flow duration curve, water years 1912–2023.

The mean, minimum, and maximum monthly average flows in the East Branch Russian River near Calpella, California, are summarized in Table 3.3.1-16. A hydrograph of monthly average flow over the past 10 years is shown on Figure 3.3.1-13. A flow duration curve of flows in the East Branch Russian River near Calpella, California, is shown on Figure 3.3.1-14.

Table 3.3.1-16. Monthly mean, minimum, and maximum flows (in cfs) in the East Branch Russian River near Calpella, California.

Month	East Branch Russian River near Calpella, California					
	Unimpaired, 1942–2023			Impaired, 1942–2023		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
October	8	0	132	199	5	352
November	69	1	470	249	16	738
December	276	2	1,156	465	26	1,476
January	381	1	1,408	589	12	1,720
February	354	10	1,604	581	22	1,815
March	240	14	1,234	489	43	1,611
April	102	5	509	324	12	847
May	30	2	149	215	24	429
June	9	1	43	149	15	363
July	2	0	8	125	8	275
August	1	0	3	126	19	276
September	1	0	5	167	24	298

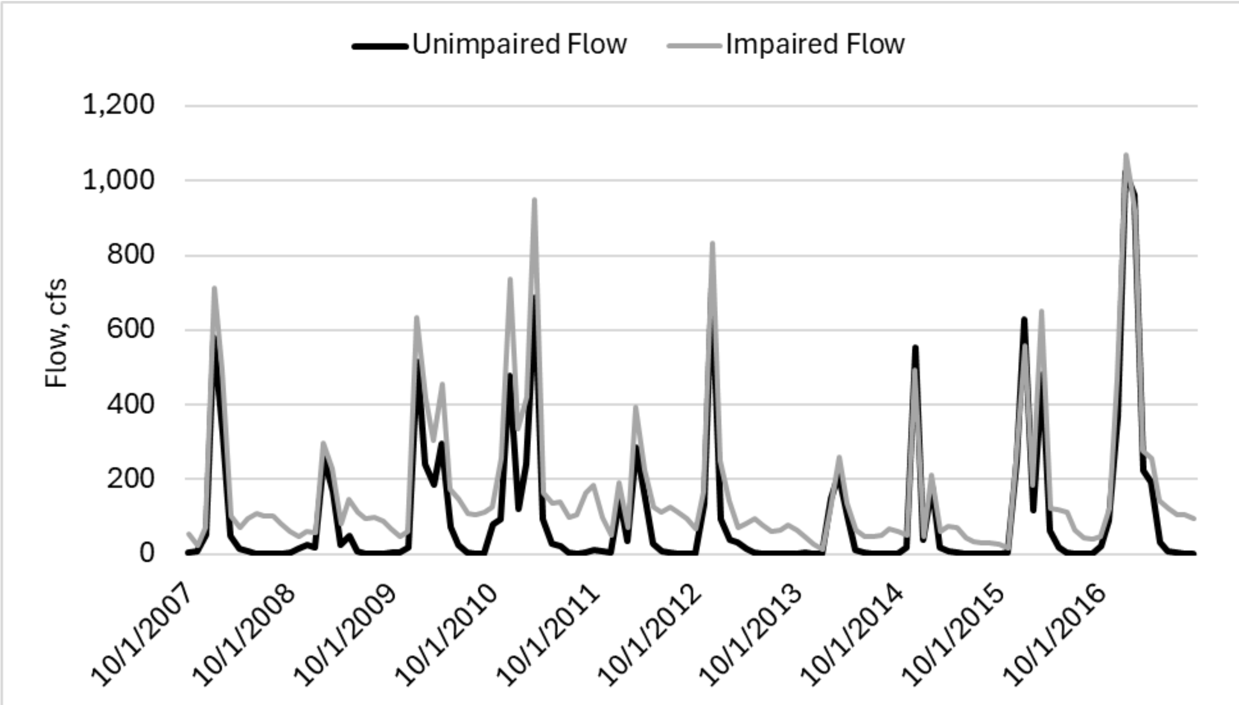


Figure 3.3.1-13. East Branch Russian River below Potter Valley Powerhouse Tailrace, water years 2008–2017.

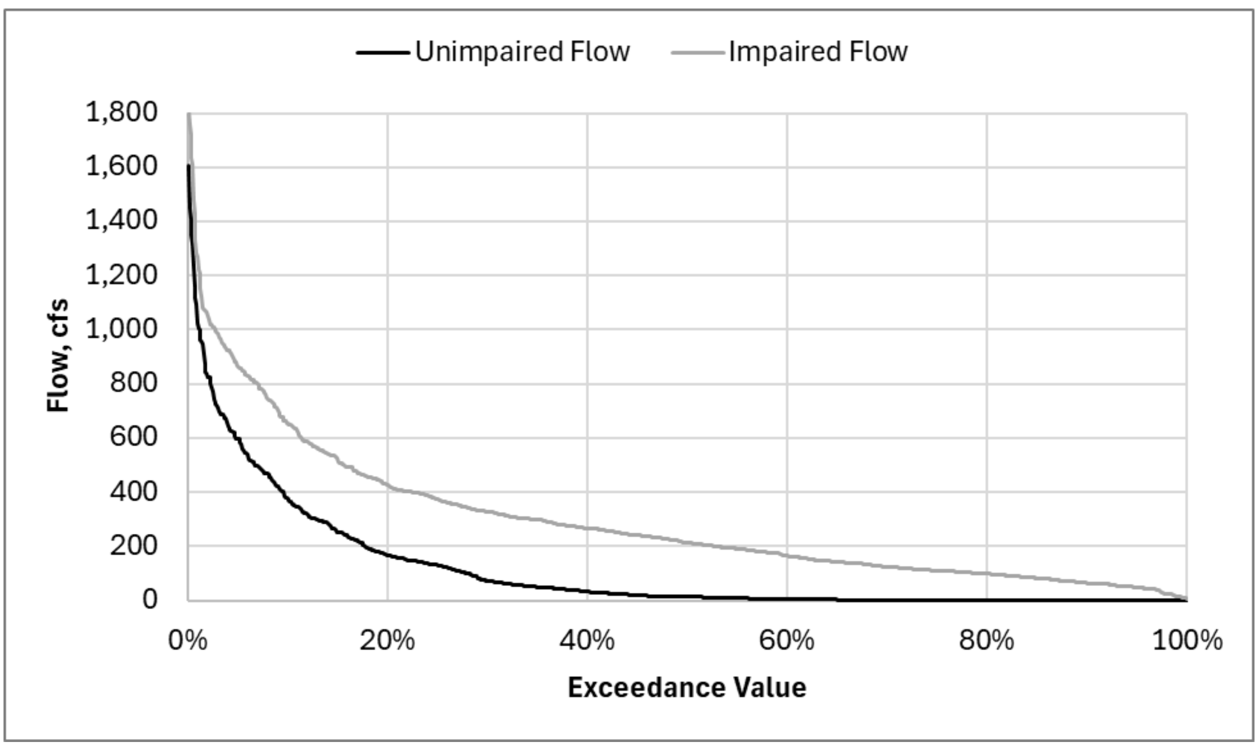


Figure 3.3.1-14. East Branch Russian River below Potter Valley Powerhouse Tailrace flow duration curve, water years 1942–2017.

Table 3.3.1-17. Flood frequency flows (in cfs) in the Russian River at Calpella, California, water years 1942–2017.

Return Interval	Unimpaired Flow, cfs	Impaired Flow, cfs
50-year	11,780	12,500
20-year	7,258	7,620
10-year	6,140	6,700
5-year	5,017	5,380
2-year	3,178	3,350
1-year	74	311

Eel River Diversion Compared to Unimpaired Eel River Flow

Annual Project diversions out of the Eel River constituted approximately 27 percent of the unimpaired flow in the Eel River at Cape Horn Dam on average over the operation of the Project. Annual volumes of Project diversions out of the Eel River and unimpaired Eel River volumes are shown on Figure 3.3.1-15.

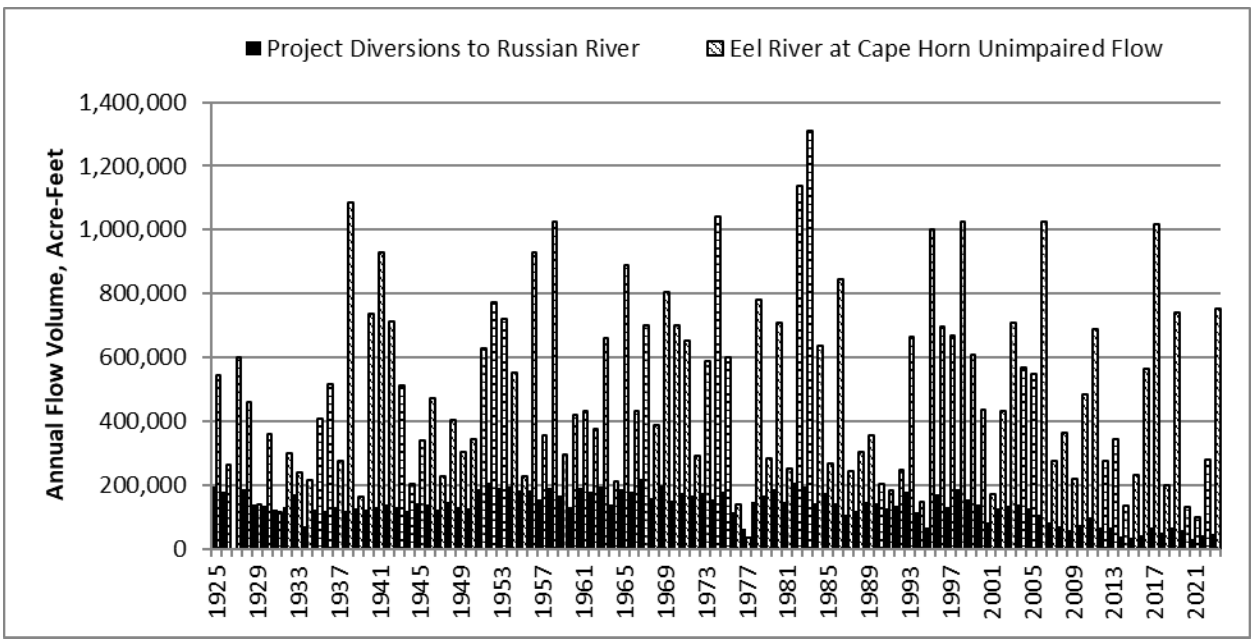


Figure 3.3.1-15. Annual unimpaired flow in Eel River at Cape Horn Dam and Project diversion to the East Branch Russian River, 1925–2023.

Powerhouse Releases Compared to Total East Branch Russian River Flow

Powerhouse releases significantly supplement natural flows in the East Branch Russian River, but the contribution has been declining in recent years with changes in license requirements, as well as flow variances due to drought, limited water storage, and coldwater pool concerns. Annual powerhouse releases constituted approximately 55 percent of the total flow in the East Branch

Russian River above Lake Mendocino (USGS Gage No. 11461500, Russian River near Calpella, California) on average over the period of 1973–2023. Annual volumes of Project releases to the East Branch Russian River and total flow in the East Branch Russian River above Lake Mendocino at the Calpella stream gage are shown on Figure 3.3.1-16.

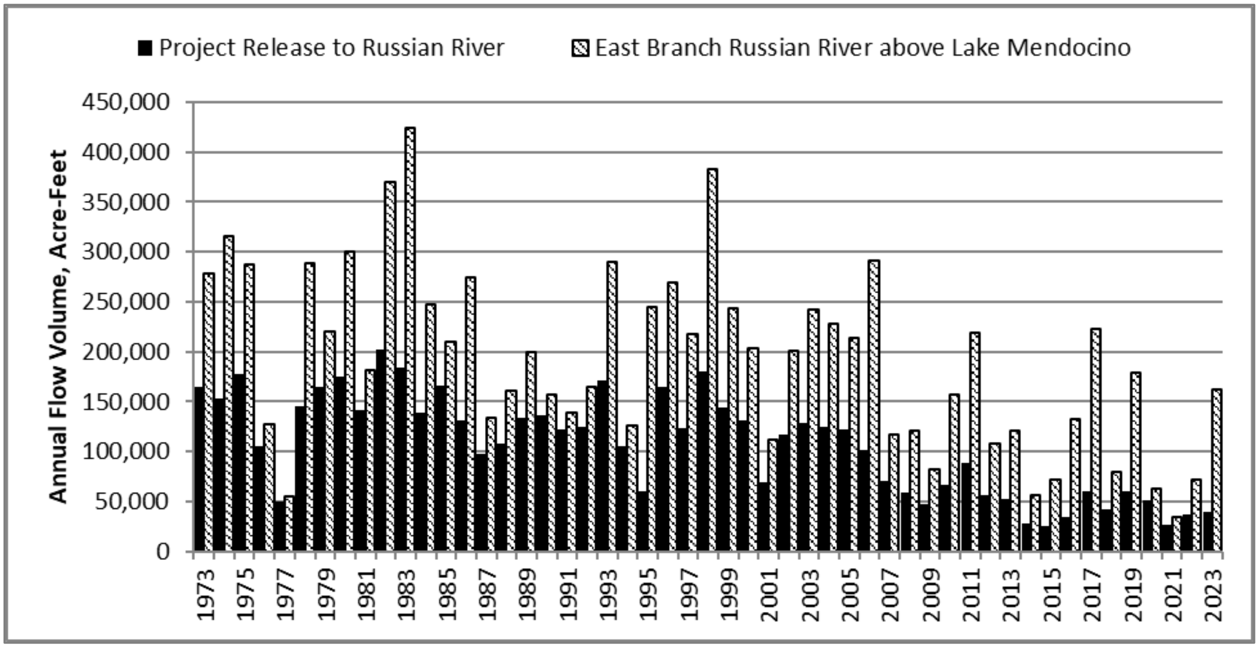


Figure 3.3.1-16. Annual total flow in East Branch Russian River near Calpella, California, and powerhouse releases, 1973–2023.

Modeled Existing Flows and Proposed Project Flows

Modeled existing flows and proposed Project flows are modeled using a period of record including water years 2004 through 2023.

Existing flows are modeled to reflect existing conditions with the seismic restriction on Lake Pillsbury storage (maximum storage equals the spillway crest) and recent variances (2023 and 2024) and PG&E's proposed amendment flows. Specifically, the amendment flows for the East Branch Russian River discussed in Section 3.3.1.12 are included in the model and removal of the block water flow release requirement. Resulting modeled existing storage at Lake Pillsbury compared to historic storage is shown on Figure 3.3.1-17.

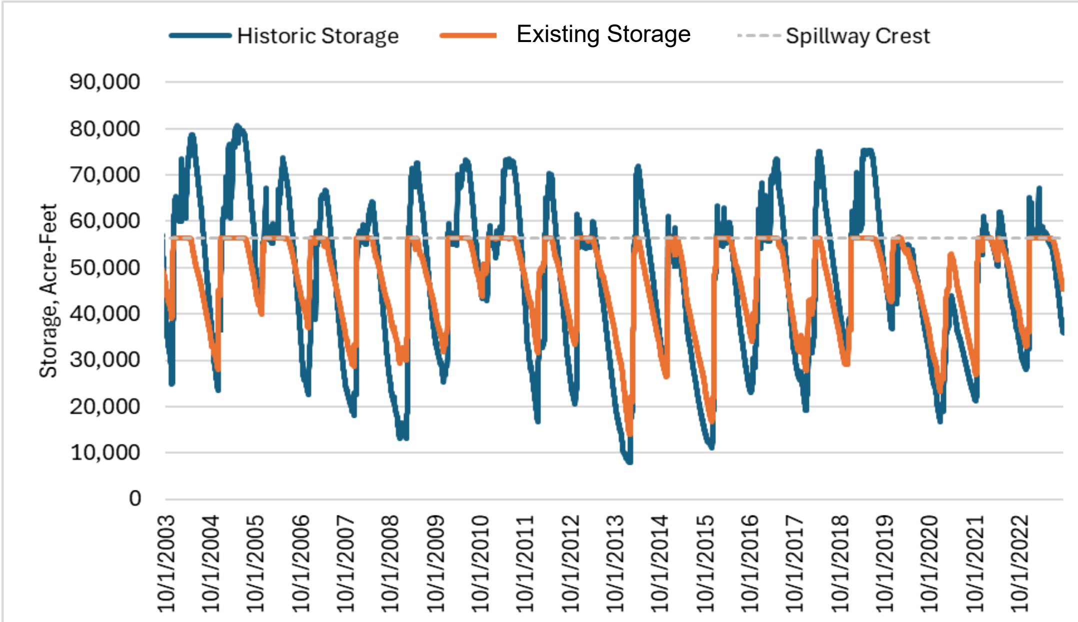


Figure 3.3.1-17. Modeled existing versus historic storage at Lake Pillsbury.

The Proposed Project would remove Scott Dam and Cape Horn Dam, and proposed Project flows would be the natural unimpaired flows in the Eel River and East Branch Russian River. Modeled existing and proposed Project flows in the Eel River below Scott Dam are shown on Figure 3.3.1-18.

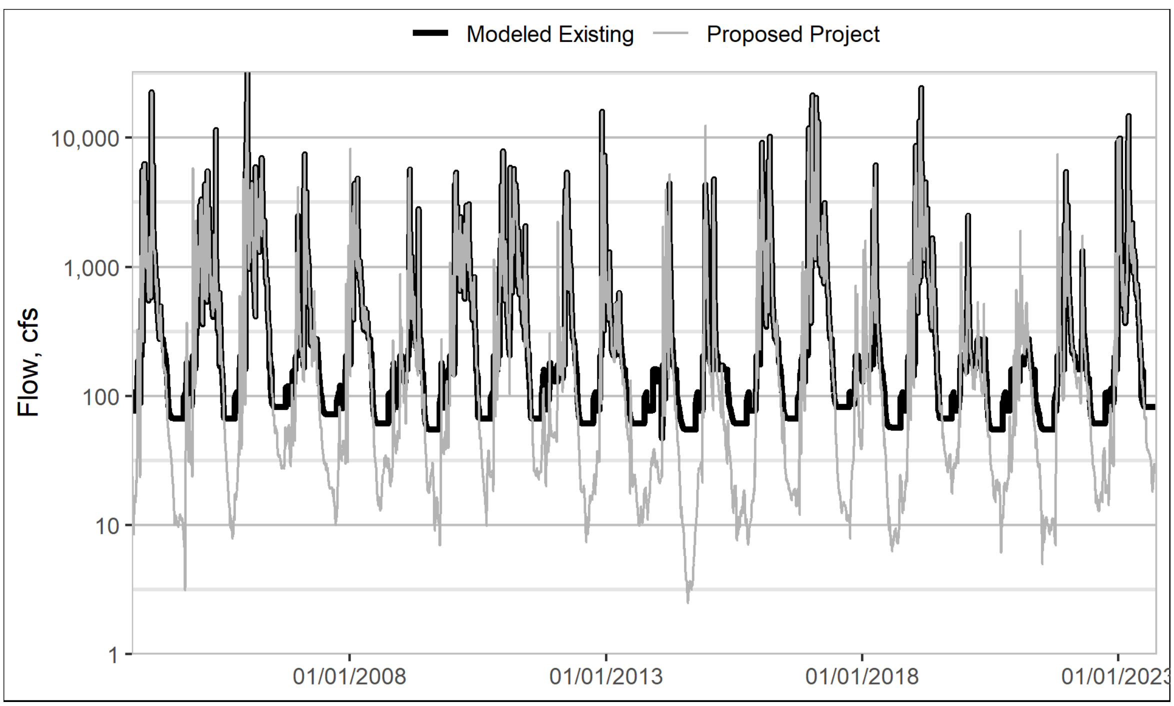


Figure 3.3.1-18. Modeled existing and proposed Project flow in the Eel River below Scott Dam.

Modeled existing and proposed Project flows in the Eel River below Cape Horn Dam are shown on Figure 3.3.1-19.

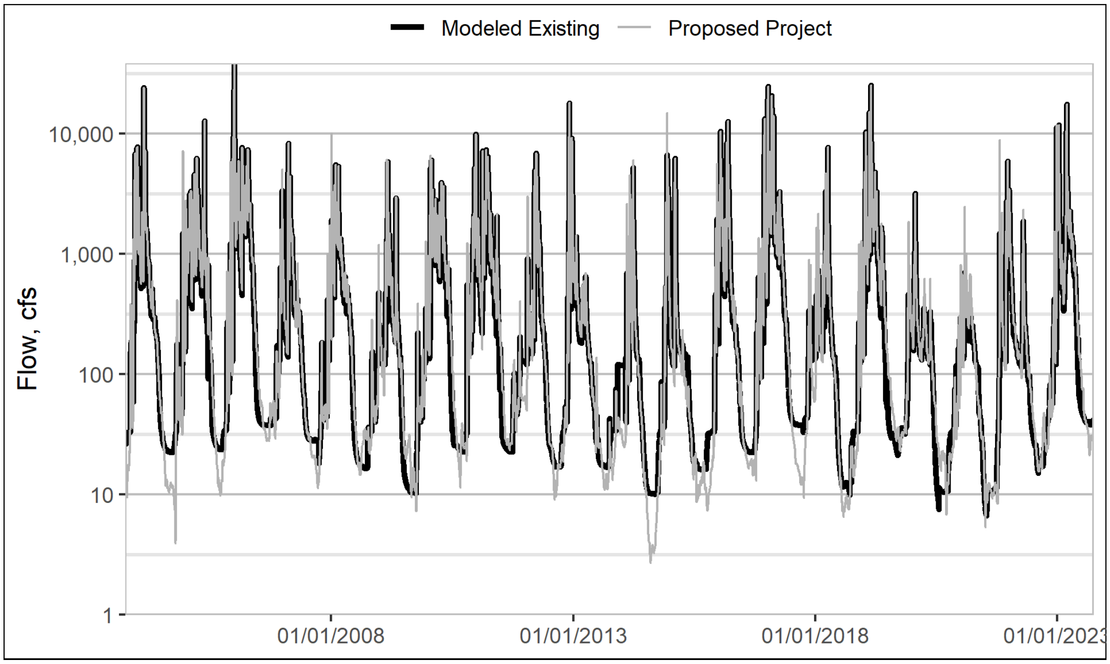


Figure 3.3.1-19. Modeled existing and proposed Project flow in the Eel River below Cape Horn Dam.

Total diversion from the Eel River is shown on Figure 3.3.1-20. The modeled existing flows are based on PG&E's proposed amendment flows for the East Branch Russian River and average PVID irrigation season deliveries in recent years. Under the proposed Project, the diversion into the Potter Valley Powerhouse tunnel would be zero.

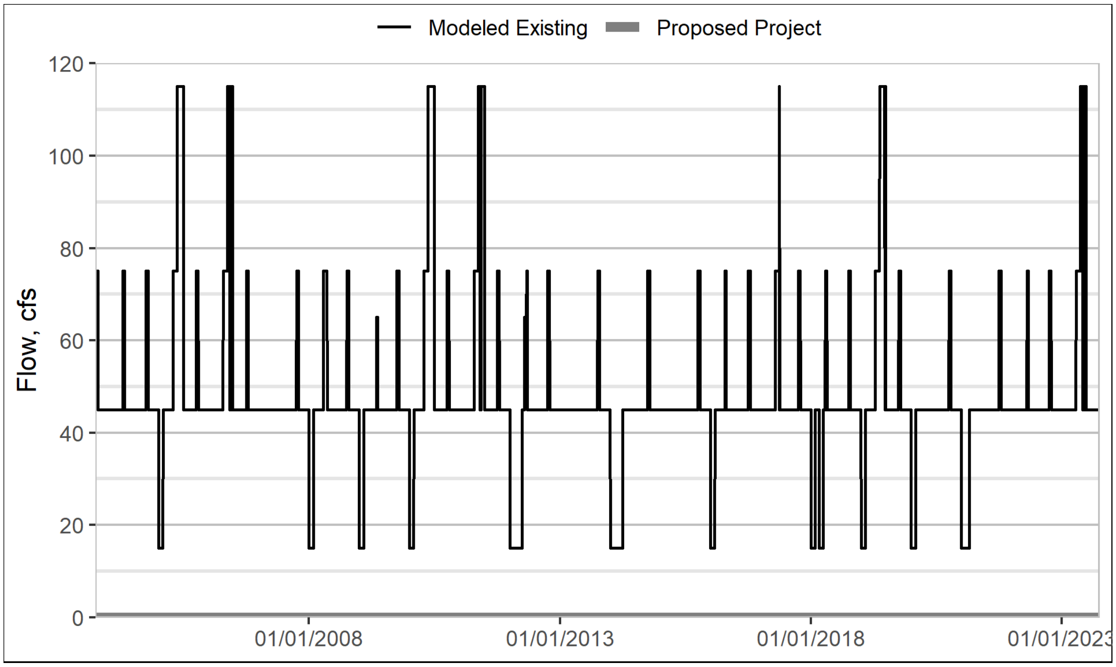


Figure 3.3.1-20. Modeled existing and proposed Project flow diverted from the Eel River into the diversion tunnel.

Modeled existing and proposed Project flows released into the East Branch Russian River are shown on Figure 3.3.1-21. Under the proposed Project, the release into the East Branch Russian River would be zero.

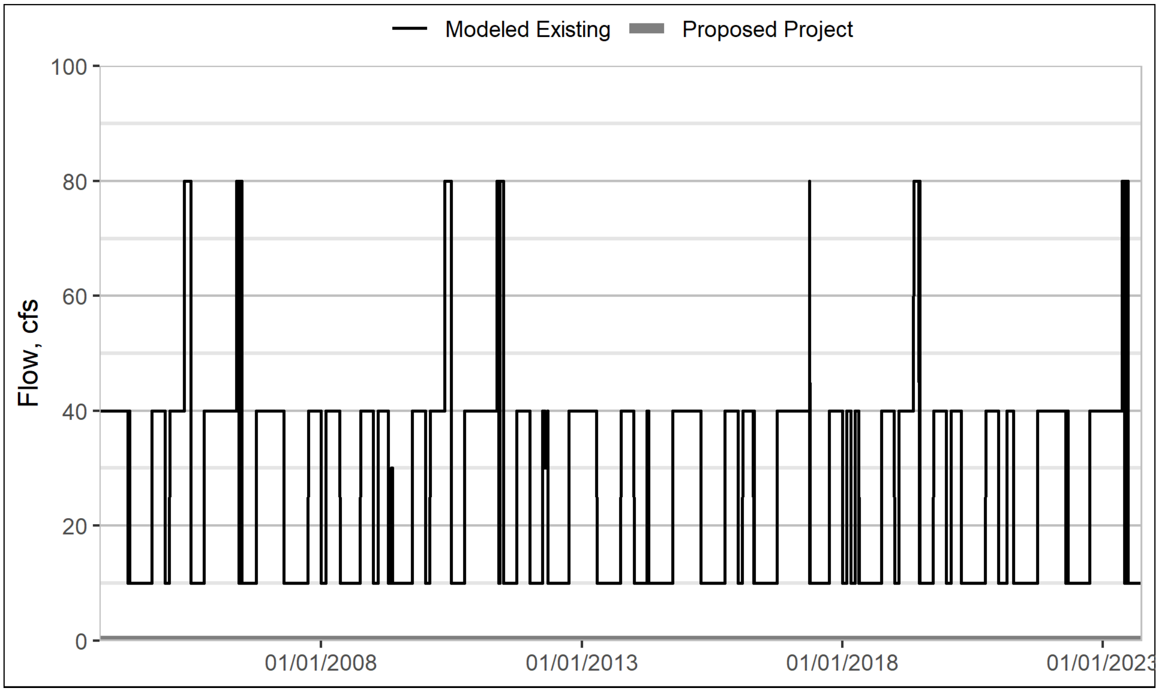


Figure 3.3.1-21. Modeled existing and proposed Project flow released into the East Branch Russian River.

Diversions into the Potter Valley Powerhouse diversion tunnel have two components: deliveries to PVID and releases into the East Branch Russian River. The combination of the two forms the total diversion rate. Figure 3.3.1-22 shows the components of the total diversions when PVID takes its average deliveries of 35 cfs or full contract deliveries of 50 cfs.

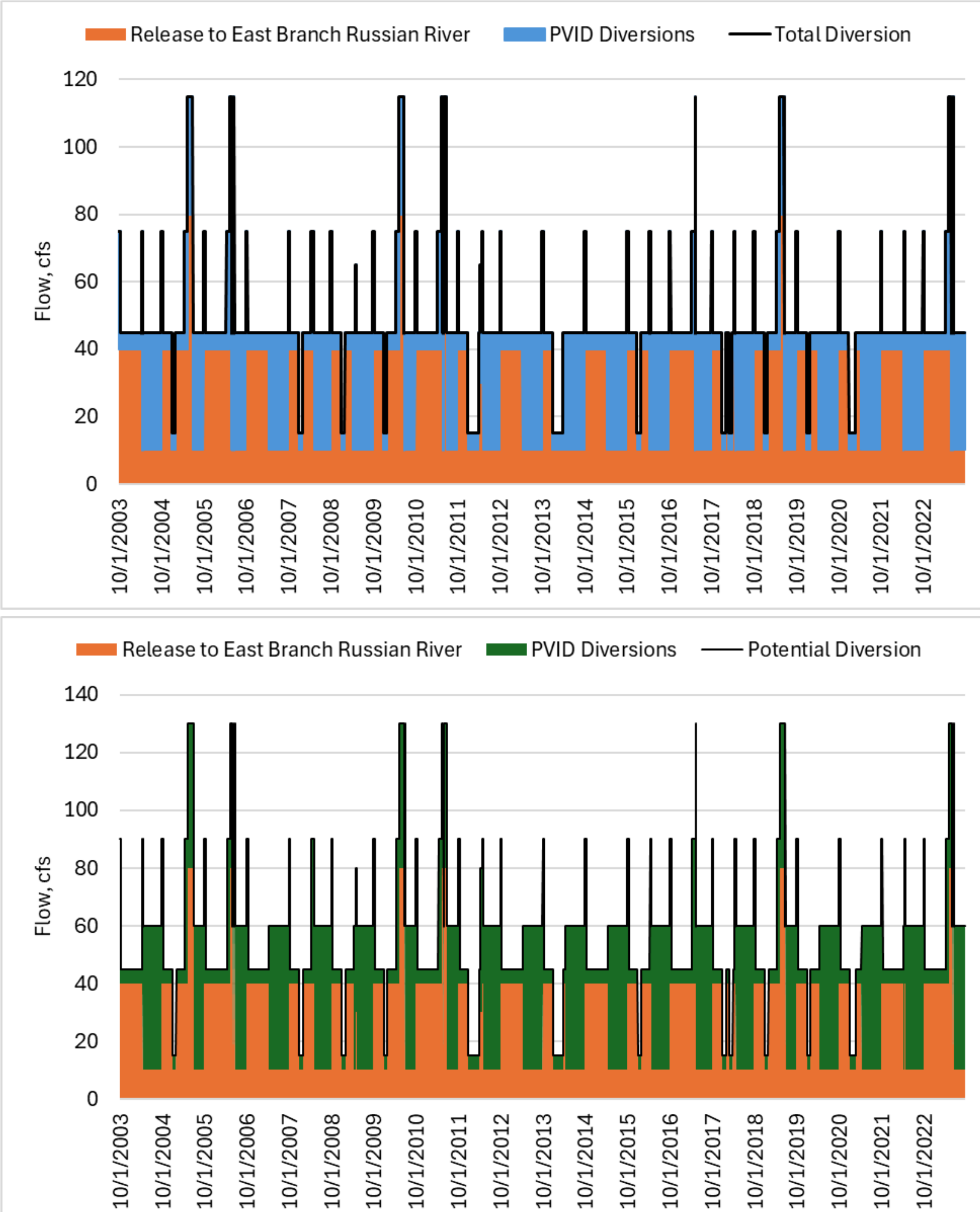


Figure 3.3.1-22. Modeled existing flow releases into the East Branch Russian River with PVID average diversions (top) and modeled existing flow release with PVID maximum diversions (bottom).

Dam Removal Pulse Flow Release

The removal of the Scott Dam adit plug during dam removal will create a release from Scott Dam of approximately 7,000 cfs. As shown in Table 3.3.1-7, this flow is approximately the same as the 2-year impaired flood event and less than the 2-year unimpaired flood event in the Eel River at Scott Dam. A 7,000-cfs flow in the Eel River at Scott Dam has an approximate return interval of 1.4 years, and in the Eel River at Cape Horn Dam, it has an approximate return interval of 1.3 years for unimpaired conditions.

3.3.1.16 Generation

Available generation data span 1972 through 2023 (PG&E 2016, 2023). Figure 3.3.1-23 depicts monthly generation from 1972 through 2023. A transformer issue was discovered in the summer of 2021, and generation at the powerhouse was discontinued. Average annual generation at the Potter Valley Powerhouse when it was operational (1972–2020) was approximately 41,400 megawatt-hours (MWh). Monthly generation data for 2007 through 2021 are shown in Table 3.3.1-18.

3.3.1.17 Reservoir Storage

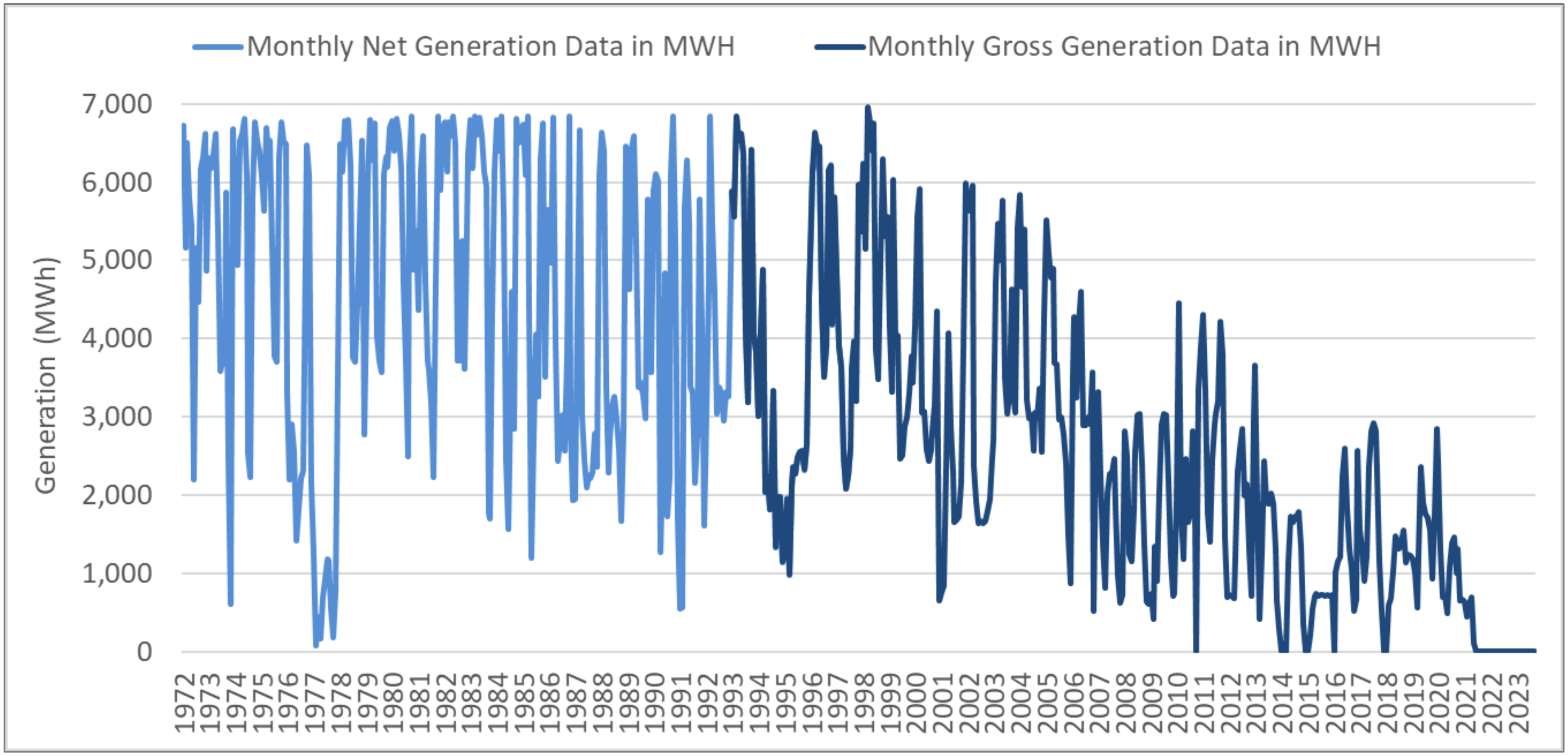
Lake Pillsbury

Based on the latest bathymetric survey, Lake Pillsbury has a gross storage capacity of approximately 69,871 AF at the top of the gates, elevation of 1,828.3 ft. NGVD 29. (PG&E 2024), which is about 7,000 AF less than the estimate in 2015–2016 (PG&E 2017). With the gates on top of the dam being restricted from being used to impound storage due to dam safety concerns, the maximum capacity is reduced by approximately 16,623 AF. Reservoir storage and surface area profiles are shown in Table 3.3.1-19 and on Figure 3.3.1-24. The volume of water storage, pre–dam safety issues, was approximately 33 percent of the average annual runoff in the watershed above Scott Dam.

Lake Pillsbury generally reaches its peak storage in April or May and is drawn down throughout the late spring and summer, reaching a low point somewhere between November and January depending on hydrologic conditions. Lake Pillsbury is generally drawn down to between 15,000 and 25,000 AF of storage, but in some dry years, it is drawn down as low as approximately 10,000 AF. The minimum of 12,000-AF drawdown is due to concerns of bank instability in the reservoir and the potential for sloughing material to block the outlet needle valve or be released downstream, creating high turbidity and streambed sedimentation.

Van Arsdale Reservoir

Van Arsdale Reservoir has a gross storage capacity of 390 AF at an elevation of 1,494 ft. The reservoir is generally used as a regulating reservoir for the diversion intake.



Note: Gross generation is the total generation produced by the powerhouse. Net generation is the total generation produced by the powerhouse less powerhouse energy use (i.e., the amount of generation that actually leaves the powerhouse for distribution to the customer). Net generation data and gross generation data overlap from January 1993 to July 1997.

Figure 3.3.1-23. Potter Valley Powerhouse monthly generation, 2007–2023.

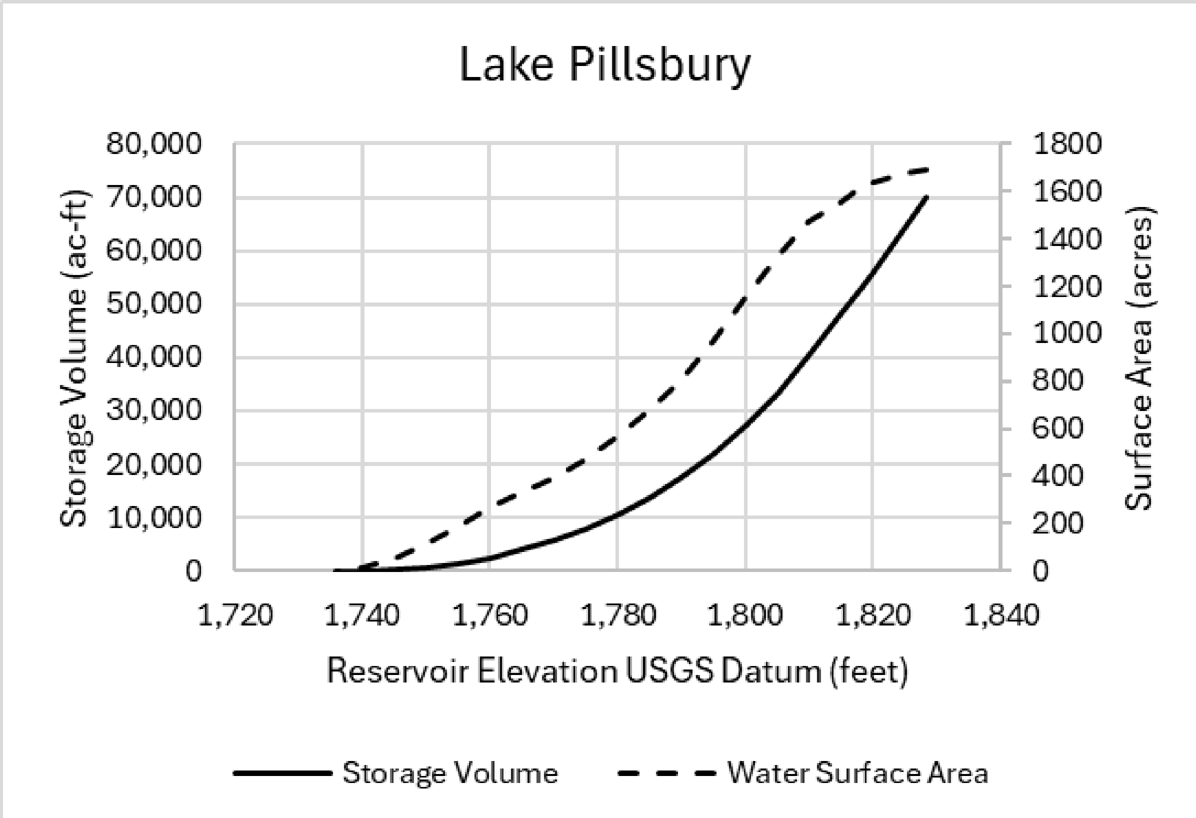
Table 3.3.1-18. Potter Valley Powerhouse average annual and monthly generation, 2007–2023.

Year	Month												Annual Total (MWh)
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	
2007	3,314	2,242	1,373	809	2,024	2,272	2,288	2,465	1,860	974	625	717	**20,961**
2008	2,818	2,493	1,232	1,149	1,813	2,557	3,020	3,034	2,383	1,361	641	608	**23,107**
2009	735	414	1,340	902	2,050	2,911	3,037	3,027	2,166	1,201	702	738	**19,223**
2010	1,920	4,458	1,733	1,183	2,462	1,658	1,768	2,811	1,821	–	3,360	3,892	**27,066**
2011	4,311	3,327	1,765	1,403	2,455	2,907	3,033	3,198	4,224	3,798	1,438	697	**32,557**
2012	729	715	683	1,203	2,302	2,595	2,850	1,987	2,133	1,307	707	2,943	**20,155**
2013	3,662	1,914	411	1,250	2,430	1,907	1,890	2,014	1,885	1,292	644	274	**19,573**
2014	–	–	–	1,140	1,727	1,645	1,728	1,723	1,789	1,343	348	–	**11,443**
2015	–	202	545	1,370	1,622	1,253	1,200	1,092	782	496	–	–	**8,562**
2016	–	1,014	1,152	1,202	2,238	2,597	1,833	1,318	1,049	510	661	2,567	**16,141**
2017	1,548	1,318	901	1,204	2,365	2,824	2,920	2,822	2,308	1,147	510	0	**19,868**
2018	0	597	678	1,031	1467	1,430	1,311	1,396	1,542	1,143	1,236	1,227	**13,059**
2019	1,173	1,003	561	1,237	2,364	1,898	1,753	1,715	1,552	931	1,743	2,839	**18,769**
2020	2,403	1,299	690	711	494	1,071	1,393	1,463	999	1,306	652	657	**13,137**
2021	637	448	598	687	105	–	–	–	–	–	–	–	**2,474**
2022	–	–	–	–	–	–	–	–	–	–	–	–	–
2023	–	–	–	–	–	–	–	–	–	–	–	–	–
2007–2020 Average (MWh)	**1,615**	**1,500**	**933**	**1,128**	**1,987**	**2,109**	**2,145**	**2,148**	**1,892**	**1,201**	**948**	**1,226**	**18,830**

Table 3.3.1-19. Lake Pillsbury storage and surface area versus elevation.

Reservoir Elevation (NGVD 29)	Reservoir Surface Area (acres)	Reservoir Storage (AF)	Notes
1,828.30	1,692	69,871.36	Top of gates
1,825.00	1,674	64,312.00	
1,820.00	1,639	56,023.23	
1,818.30	1,625	53,247.98	Spillway crest
1,815.00	1,556	47,959.21	
1,810.00	1,477	40,365.46	
1,805.00	1,330	33,299.02	
1,800.00	1,153	27,057.32	
1,795.00	975	21,771.90	
1,790.00	804	17,312.85	
1,785.00	678	13,638.87	
1,780.00	573	10,521.28	
1,775.00	473	7,917.93	
1,770.00	390	5,768.16	
1,765.00	332	3,971.76	
1,760.00	267	2,472.43	
1,755.00	182	1,329.41	
1,750.00	116	585.4	
1,745.00	52	167.26	
1,740.00	13	16.2	
1,736.00	0	0	

Source: Based on bathymetric data collected in 2023 (PG&E 2024).



Source: Based on bathymetric data collected in 2023 (PG&E 2024).

Figure 3.3.1-24. Lake Pillsbury storage and surface area versus elevation.

3.3.1.18 References

CDEC (California Data Exchange Center). 2024a. CDEC SCD Scott Dam. Available at: https://cdec.water.ca.gov/dynamicapp/staMeta?station_id=SCD. Accessed April 22, 2024.

CDEC (California Data Exchange Center). 2024b. CDEC PVP Potter Valley Powerhouse. Available at: https://cdec.water.ca.gov/dynamicapp/staMeta?station_id=PVP. Accessed April 22, 2024.

Eel River Forum (ERF). 2016. The Eel River Action Plan: a compilation of information and recommended actions. Final Report. Prepared for The Eel River Forum.

FERC (Federal Energy Regulatory Commission). 1983. Opinion and Order Denying Appeal, Approving Settlement, and Issuing New License. October 4.

FERC (Federal Energy Regulatory Commission). 2004. Order Amending License. January 28.

NMFS (National Marine Fisheries Service). 2002. Biological Opinion for the Proposed License Amendment for the Potter Valley Hydroelectric Project (FERC Project No. 77-110). Southwest Region. November.

PG&E (Pacific Gas and Electric Company). 2006. Van Arsdale Reservoir Bathymetric Survey, Technical, and Land Services.

PG&E (Pacific Gas and Electric Company). 2015. Supporting Technical Information Document for Cape Horn Dam (Van Arsdale Reservoir) (Part 12D Independent Consultant Five-Year Safety Inspection Report).

PG&E (Pacific Gas and Electric Company). 2016. Generation and flow data provided by PG&E.

PG&E (Pacific Gas and Electric Company). 2017. Lake Pillsbury Bathymetric Survey – 2016. Prepared by PG&E Applied Technology Services. Report No. 026.11-16.3.

PG&E (Pacific Gas and Electric Company). 2023. Generation and flow data provided by PG&E.

PG&E (Pacific Gas and Electric Company). 2024. Lake Pillsbury Bathymetric Survey 2023. Prepared by PG&E Applied Technology Services. Report No. 026.11-24.3.

SWRCB (State Water Resources Control Board). 2016. e-WRIMS Water Rights Search Results. Available at: https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/EWServlet?_Page_From=EWWaterRightPublicSearch.jsp&Redirect_Page=EWWaterRightPublicSearchResults.jsp&Object_Expected=EwrimsSearchResult&Object_Created=EwrimsSearch&Object_Criteria=&Purpose=&subTypeCourtAdjSpec=&subTypeOtherSpec=&appNumber=&permitNumber=&licenseNumber=&waterHolderName=Pacific+Gas+And+Electric&source=Eel+River&hucNumber=&watershed=.

USGS (U.S. Geological Survey). 2024a. USGS 11470000 Lake Pillsbury Water Surface Elevation. Available at: https://waterdata.usgs.gov/nwis/dv/?site_no=11470000. Accessed April 23, 2024.

USGS (U.S. Geological Survey). 2024b. USGS 11470500 Eel River below Scott Dam near Potter Valley, California. Available at: https://waterdata.usgs.gov/nwis/dv/?site_no=11470500. Accessed April 23, 2024.

USGS (U.S. Geological Survey). 2024c. USGS 11471105 Potter Valley Irrigation Canal E5 near Potter Valley, California. Available at: https://waterdata.usgs.gov/nwis/dv/?site_no=11471105. Accessed on April 23, 2024.

USGS (U.S. Geological Survey). 2024d. USGS 11471106 Potter Valley Irrigation Canal E6 near Potter Valley, California. Available at: https://waterdata.usgs.gov/nwis/dv/?site_no=11471106. Accessed April 23, 2024.

USGS (U.S. Geological Survey). 2024e. USGS 11471500 Eel River at Van Arsdale Dam near Potter Valley, California. Available at: https://waterdata.usgs.gov/nwis/dv/?site_no=11471500. Accessed April 23, 2024.

USGS (U.S. Geological Survey). 2016f. USGS 11471000 Potter Valley Powerhouse Intake near Potter Valley CA. Available at http://waterdata.usgs.gov/nwis/dv/?site_no=11471000.

USGS (U.S. Geological Survey). 2016g. USGS 11461500 EF Russian River near Calpella CA. Available at http://waterdata.usgs.gov/nwis/dv/?site_no=11461500.

USGS (U.S. Geological Survey). 2016h. USGS 11475000 Eel River near Fort Seward CA. Available at http://waterdata.usgs.gov/nwis/dv/?site_no=11475000.

USGS (U.S. Geological Survey). 2016i. USGS 11477000 Eel River near Scotia CA. Available at http://waterdata.usgs.gov/nwis/dv/?site_no=11477000.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Figures

List of Maps

List of Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
µS/cm	microSiemens per centimeter
µg/L	micrograms per liter
µg/g^3	micrograms per cubic gram
Basin Plan	*Water Quality Control Plan for the North Coast Region*
BGA-PC	phycocyanin
BOD	biochemical oxygen demand
CCHAB Network	California CyanoHAB Network
CDFW	California Department of Fish and Wildlife
CEDEN	California Environmental Data Exchange Network
CWA	Clean Water Act
DO	dissolved oxygen
FERC	Federal Energy Regulatory Commission
g	gram(s)
m	meter
MCL	maximum contaminant level
MNF	Mendocino National Forest
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliters
mm	millimeter
MTBE	methyl tert-butyl ether
MUN	municipal and domestic supply
MWAT	maximum weekly average temperature
NCRWQCB	North Coast Regional Water Quality Control Board
ng/L	nanograms per liter
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Unit
PCB	polychlorinated biphenyls

PG&E	Pacific Gas and Electric Company
ppm	parts per million
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
RM	River Mile
RPA	Reasonable and Prudent Alternative
SPATT	Solid Phase Adsorption Toxin Tracking
SpCond	specific conductance
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TMDL	total maximum daily loads
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VAFS	Van Arsdale Fisheries Station

3.3.2 Water Quality

This section describes water quality in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). Information on water use and hydrology is addressed in Section 3.3.1.

The study area for water quality includes Lake Pillsbury, Van Arsdale Reservoir, and river reaches potentially affected by Project operations: the Eel River between Scott Dam and Van Arsdale Reservoir; the Eel River between Cape Horn Dam and the Pacific Ocean; and the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino (see Map 3.3.2-1).

3.3.2.1 Information Sources

The following primary documents and data sources were used to develop information on water quality:

- Annual PG&E water temperature monitoring reports from 2005 to 2023;
- Stream temperature data collected by the Mendocino National Forest (MNF; 1996–2004);
- California Environmental Data Exchange Network (CEDEN) database queries of available water quality data;
- North Coast Regional Water Quality Control Board (NCRWQCB) staff reports on pathogen monitoring;
- State Water Resources Control Board (SWRCB) reports prepared for the Surface Water Ambient Monitoring Program (SWAMP);
- Available reports on Cyanobacteria and algal toxins from the NCRWQCB and PG&E;
- Water quality data collected in 2018 during the relicensing process for the Project (PG&E 2019a); and
- PG&E 2020 to 2023 Summer Water Temperature Monitoring Program data (PG&E 2023).

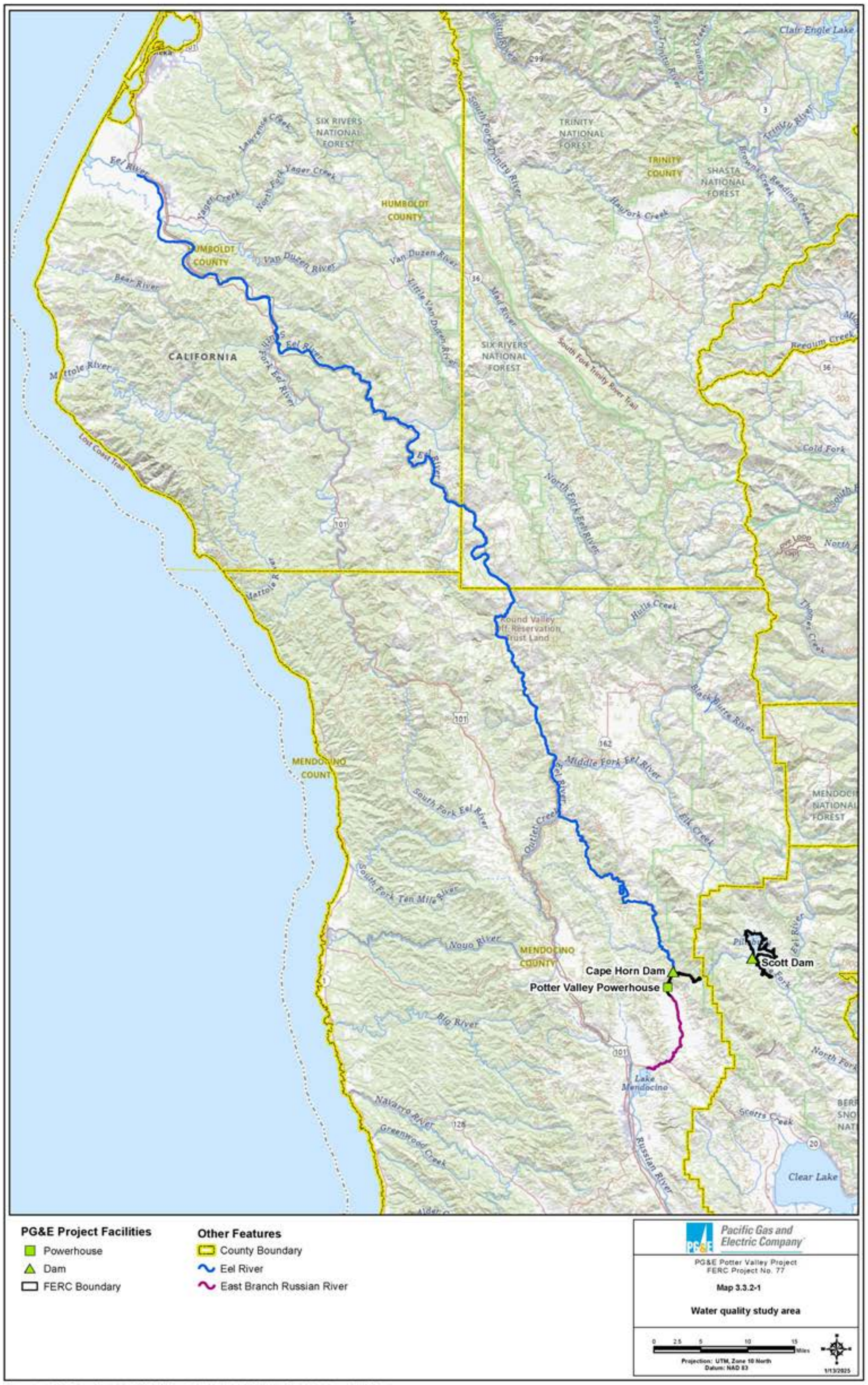
3.3.2.2 State Water Quality Standards

State water quality standards "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses" (33 U.S. Code USC §1313[C][2][A]). Regional Water Quality Control Board basin plans provide standards through (1) a designation of existing and potential beneficial uses, (2) water quality objectives to protect those beneficial uses, and (3) implementation programs designed to achieve those objectives. Recently revised in 2018, the NCRWQCB developed the *Water Quality Control Plan for the North Coast Region* (Basin Plan), which sets forth water quality standards for the Eel River Hydrologic Unit and subareas, which include the study area on the Eel River (Lake Pillsbury and Tomki Creek hydrologic subareas in the Upper Main Eel River; Sequoia and Spy Rock hydrologic subareas in the Middle Main Eel River; Ferndale and Scotia hydrologic subareas in the Lower Eel River) and the Coyote Valley Hydrologic Subarea in the Upper Russian River, which includes the East Branch Russian River (NCRWQCB 2018) (Table 3.3.2-1).

Beneficial Uses

The Basin Plan water quality standards are composed of designated existing (E) and potential (P) beneficial uses and water quality objectives. According to the Basin Plan, existing beneficial uses for the study area include the following (Table 3.3.2-1):

- Municipal and domestic supply (MUN);
- Agricultural supply (AGR);
- Industrial service supply (IND);
- Industrial process supply (PRO);
- Groundwater recharge (GWR);
- Freshwater replenishment (FRSH);
- Navigation (NAV);
- Power generation (POW);
- Contact recreation (REC-1);
- Non-contact recreation (REC-2);
- Commercial and sport fishing (COMM);
- Warm freshwater habitat (WARM);
- Cold freshwater habitat (COLD);
- Wildlife habitat (WILD);
- Rare, threatened, or endangered species (RARE);
- Migration of aquatic organisms (MIG);
- Cold spawning habitat (SPWN); and
- Aquaculture (AQUA).



Map 3.3.2-1 Water quality study area

Table 3.3.2-1. Existing (E) and potential (P) beneficial uses of waters designated in the study area by the Basin Plan.

HU/ HA/ HSA	Hydrologic Unit/Area/ Subunit/Drainage Feature	Beneficial Uses																					
		MUN	AGR	IND	PRO	GWR	FRSH	NAV	POW	REC1	REC2	COMM	WARM	COLD	WILD	RARE	MAR	MIGR	SPWN	SHELL	EST	AQUA	CUL
111.00	Eel River Hydrologic Unit																						
111.21	Lower Eel River Hydrologic Area																						
111.22	Ferndale Hydrologic Subarea	E	E	E	P	E	E	E	E	E	E	E	–	E	E	E	P	E	E	E	E	P	E
111.23	Scotia Hydrologic Subarea	E	E	E	P	E	E	E	P	E	E	E	–	E	E	E	–	E	E	–	–	E	–
111.40	Middle Fork Eel River Hydrologic Area																						
111.41	Sequoia Hydrologic Subarea	E	E	E	P	E	E	E	E	E	E	E	E	E	E	E	–	E	E	–	–	P	–
111.42	Spy Rock Hydrologic Subarea	E	E	E	P	E	E	E	E	E	E	E	E	E	E	E	–	E	E	–	–	P	–
111.60	Upper Main Eel River Hydrologic Area																						
111.62	Tomki Creek Hydrologic Subarea	E	E	E	P	E	E	E	P	E	E	E	E	E	E	E	–	E	E	–	–	E	–
111.63	Lake Pillsbury Hydrologic Subarea	E	E	E	P	E	E	E	E	E	E	E	E	E	E	E	–	E	E	–	–	E	–
114.30	Upper Russian River Hydrologic Unit																						
114.32	Coyote Valley Hydrologic Area	E	E	E	P	E	E	E	E	E	E	E	E	E	E	E	–	E	E	–	–	P	–

Source: NCRWQCB 2018

Water Quality Objectives

The NCRWQCB has adopted water quality objectives to protect identified beneficial uses. Basin Plan water quality objectives are specific to the intended uses and include narrative and numeric criteria for color, tastes and odors, floating material, suspended material, settleable material, oil and grease, biostimulatory substances (e.g., nitrogen and phosphorous), sediment, turbidity, pH, dissolved oxygen (DO), bacteria, temperature, toxicity, pesticides, chemical constituents (e.g., mercury and specific conductance [SpCond]), and radioactivity. Numeric criteria for pH, DO, fecal coliform, and water temperature in the Eel River Watershed are as follows (NCRWQCB 2018):

- pH—6.5 to 8.5, changes in normal ambient pH levels shall not exceed 0.5 unit within the range specified above in fresh waters with COLD or WARM beneficial uses;
- DO (COLD)—daily minimum objective of 6.0 milligrams per liter (mg/L);
- DO (COLD)—7-day moving average objective of 8.0 mg/L;
- DO (WARM)—daily minimum objective of 5.0 mg/L;
- DO (WARM)—7-day moving average objective of 6.0 mg/L;
- DO (SPWN)—daily minimum objective of 9.0 mg/L;
- DO (SPWN)—7-day moving average objective of 11.0 mg/L;
- Fecal coliform—median fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed 50/100 milliliters (mL); and
- Water temperature—at no time or place shall the temperature of any COLD water be increased by more than 5 degrees Fahrenheit (°F) above natural receiving water temperature. At no time or place shall the temperature of WARM intrastate waters be increased more than 5°F above natural receiving water temperature.

Water Quality Impaired Water Bodies

Section 303(d) of the Clean Water Act (CWA) requires that every 2 years each state submit to the U.S. Environmental Protection Agency (USEPA) a list of rivers, lakes, and reservoirs in the state that have failed to meet designated uses or water quality standards. Water bodies in the study area listed as impaired by USEPA under Section 303(d) include:

- Upper Main Eel River: for temperature, sedimentation/siltation, and aluminum;
- Lake Pillsbury: for mercury; and
- Middle Main and Lower Main Eel rivers: for temperature, sedimentation/siltation, and aluminum.

USEPA has developed water temperature and sediment total maximum daily loads (TMDLs) in the Eel River, including the Lower Eel River (USEPA 2007), Middle Eel River and tributaries (USEPA 2005), and Upper Main Eel River and tributaries (USEPA 2004). Efforts to control temperature and sediment are based on RWQCB staff using existing permitting and enforcement tools.

Water bodies in the Russian River Watershed are also listed under Section 303(d) due to impairments to water quality by several pollutants. The entire Russian River Watershed is impaired for sediment and temperature (i.e., East Branch Russian River), and Lake Mendocino is impaired for mercury.

3.3.2.3 Existing Water Quality Data

Water Temperature

Eel River

A considerable amount of historical water temperature data from the mainstem Eel River has been published. Historical documents and data sources are listed in Table 3.3.2-2.

Table 3.3.2-2. Historical mainstem Eel River water temperature data sources.

Data Source	Sites	Year(s)	Season(s)
EarthInfo 1994 – U.S. Geological Survey (USGS) Daily Values	3 sites: below Dos Rios, Ft. Seward, and Scotia	1962–1982	Year-round
Kubicek (1977) - Summer water temperature conditions in the Eel River system, with reference to trout and salmon	30 sites and 179 spot locations: extensive throughout Eel River and major tributaries	1973	Summer
PG&E annual progress reports, 1979 to 1996 (including VTN Oregon 1982; Steiner Environmental Consulting [SEC] 1987–1996, 1998)	Varies, up to 16 sites: Eel River above Lake Pillsbury to Fort Seward	1978–1995	Seasonal spring/early summer and year-round
Friedrichsen 1998 – Eel River water quality monitoring project	Approx. 220 sites: extensive throughout Upper Eel River and tributaries	1996–1997	Seasonal spring/early summer and year-round
Lewis et al. 2000 – Regional assessment of stream temperatures across Northern California and their relationship to various landscape-level and site-specific attributes	Up to 627 sites annually: extensive throughout Eel River and tributaries	1990–1998	Seasonal spring/early summer and year-round
Mendocino County Water Agency (PG&E 2005)	Vicinity of Middle Fork confluence, Lower Middle Fork	1997–2004	Summer
USEPA (PG&E 2005)	Eel River arm/tributaries above Lake Pillsbury and between dams	2003	Summer
California Department of Fish and Game (PG&E 2005)	Above Lake Pillsbury to Outlet Creek (above confluence with Middle Fork Eel River)	2003–2004	Summer

Data Source	Sites	Year(s)	Season(s)
Puckett and Van Woert (1972) – Water temperature observations in the Eel River system 1957–1969, a data report	35 sites, throughout Eel River system	1957–1969	Seasonal spring/early summer and year-round
Mendocino National Forest (Mikulovsky, U.S. Forest Service, pers. comm., 2016)	Eel River above Lake Pillsbury to below Cape Horn Dam	1996–2004	June through October

Source: PG&E 2005

The 2004 FERC amendment to Project License Article 52 [a] incorporated the "Reasonable and Prudent Alternative" (RPA) and Reasonable and Prudent Measure 8 from National Marine Fisheries Service's (NMFS's) biological opinion (NMFS 2002). Pursuant to the RPA, PG&E (2005) prepared a *Summer Water Temperature Monitoring Plan* that was approved by FERC on November 9, 2005. FERC also added Article 57 to the license, which required continuous temperature monitoring in the Eel River below Scott Dam. As part of these studies, PG&E has collected water temperature data at 24 sites from above Lake Pillsbury downstream to below the confluence of the Middle Fork Eel River. Temperature data have been collected at 15-minute intervals from approximately the beginning of May through mid-October annually. Monitoring at some locations was discontinued in 2017 as part of a series of study trade-offs developed in collaboration with the National Marine Fisheries Service.

Detailed information on temperature conditions in the Eel River and Lake Pillsbury (2005–2023) can be found in individual monitoring PG&E reports (PG&E 2006–2024). Table 3.3.2-3 and Table 3.3.2-4 summarize maximum weekly average temperature (MWAT)[1] from the sampling locations for the years 2005 to 2015 and 2016 to 2023, respectively. Longitudinal profiles of annual MWATs within the mainstem Eel River for a very wet water year type (2011), a dry water year type[2] (2015), and recent operations (2023) are provided on Figure 3.3.2-1. Appendix 3.3.2-A provides detailed plots of daily maximum, mean, and minimum water temperatures at Eel River sites from May through October for years 2005 to 2023.

In all years, except the wettest (2011 and 2017), the MWAT upstream of Lake Pillsbury was higher than the MWAT downstream of Lake Pillsbury (Table 3.3.2-3, Table 3.3.2-4, and Figure 3.3.2-1). In each year, the relatively cool water releases from Lake Pillsbury extended downstream to around Cape Horn Dam (approximately 12 miles [mi.]), depending on the water year type, and then began rapidly warming to an equilibrium with air temperatures approximately 10 to 20 mi. downstream of Cape Horn Dam (Table 3.3.2-3, Table 3.3.2-4, and Figure 3.3.2-1). MWAT estimates in the Eel River downstream of Scott Dam ranged from a minimum of 17.0 degrees Celsius (°C) immediately below the dam in 2005 (PG&E 2006) to a maximum of 29.5°C above Outlet Creek

[1] The MWAT values were determined for each site according to the convention that calculates the maximum seasonal (summer) value for the 7-day running mean of the daily mean temperatures (when there were sufficient data to record the peak seasonal temperature, which typically occurred in July) (PG&E 2016).

[2] Water year types used are those developed by NMFS for use in the RPA flow schedules in NMFS (2002) based upon inflows to Lake Pillsbury as of May 15.

in 2006 (PG&E 2007). In almost all years, cooler water temperatures were observed within deeper pool habitats as compared with nearby riffle habitat monitoring sites (Tables 3.3.2-3 and 3.3.2-4).

In the Eel River below the Middle Fork Eel River confluence (River Mile [RM] 119.3), summer water temperatures were high (e.g., >27°C) downstream to about RM 60, where the coastal influence on air temperature reduces the river temperature; water temperature was coolest downstream of the South Fork Eel River (RM 40) (Figure 3.3.2-2) (see Appendix B in USEPA 2007). During the summer, these temperatures were still high (e.g., >23°C) and stressful for salmonids with maximum 7-day average temperatures (max7daat, which is the same as MWAT) between 19°C and 24°C (Figure 3.3.2-3) (USEPA 2007).

Table 3.3.2-3. Maximum weekly average temperature (MWAT) summary for Eel River and tributary locations included in PG&E's Annual Summer Water Temperature Monitoring Program, 2005–2015.

Site #	Eel River RM	Site Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1	181	Eel above L. Pillsbury (Bloody Rock)	21.2	23.5	22.9	22.2	23.3	21.3	20.3	22.5	23.8	24.6	24.0
2	167.8	Eel below Scott Dam (PG&E E2 gage site)	17.0	20.8	18.1	13.7[1]	20.9	19.3	21.2	21.7	22.4	20.7	22.3
3	164	Eel between the dams (Monkey Rock)	NA	24.0	22.1	22.0	20.7	19.1	21.0	21.3	22.2	20.4	22.4
4	157.8	Eel above Cape Horn Dam	20.7	24.2	22.7	22.3	20.7	18.8	20.6	21.1	NA	20.1	22.9
5	156.8	Eel at VAFS (pool)	22.7	24.3	23.2	22.6	21.0	19.4	20.3	21.5	23.1	20.8	23.2
6-R	155.7	Eel below Cape Horn Dam (riffle)	NA	24.4	22.9	22.8	22.1	20.3	20.2	22.0	23.7	22.2	23.8
6-P	155.7	Eel below Cape Horn Dam (pool)	NA	24.3	23.0	22.4	21.0	20.1	NA	21.9	22.3	20.3	23.7
7-P	154.2	Eel above Whitney Creek[2]	NA	24.1	22.1	23.1	22.2	19.4	19.3	21.4	22.3	NA	22.6
8	153.1	Eel above Tomki Creek confluence	23.8	24.6	23.8	24.5	24.6	22.2	20.9	23.3	25.4	24.5	25.5
9	–	Tomki Creek near mouth	NA	26.2	25.5	25.1	25.4	23.8	23.5	23.9	25.8	24.8	25.6
10	152.5	Eel below Tomki Creek confluence	24.4	24.4	NA	24.7	25.2	22.7	21.2	23.6	25.6	24.9	25.4
11-R	148.8	Eel below Thomas Creek (riffle)	25.1	24.6	25.6	25.7	26.1	23.9	22.0	24.5	26.4	25.8	26.5
11-P	148.8	Eel below Thomas Creek[2]	24.8	24.9	24.6	23.9	23.7	23.5	22.1	22.9	NA	23.4	24.8
12	147.2	Eel above Garcia Creek confluence	25.7	25.8	26.1	26.0	26.7	24.8	22.9	25.1	27.1	26.4	26.9
13	147.1	Eel below Garcia Creek confluence	25.7	25.8	25.9	26.1	26.5	24.7	23.0	25.1	27.0	26.4	26.8
14	145.9	Eel below Emandal	26.0	26.6	26.6	26.4	27.3	25.4	23.5	25.8	27.4	27.0	27.7
15-R	144.5	Eel near Hearst Bridge (riffle)	NA	27.3	26.9	26.6	27.5	25.8	24.0	26.0	27.8	27.1	27.7
15-P	144.5	Eel near Hearst Bridge (pool)	NA	NA	26.8	26.3	27.2	NA	24.0	25.4	NA	26.6	27.6
16-R	143.9	Eel below Hearst (riffle)	26.6	27.5	27.0	26.7	27.5	26.1	24.2	26.1	27.8	26.9	27.8
16-P	143.9	Eel below Hearst (pool)	24.8	25.5	24.7	23.9	24.3	22.8	23.5	22.1	20.5	22.4	21.2

Site #	Eel River RM	Site Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
17	142.6	Eel at Ramsing Ranch	NA	28.2	27.3	26.9	27.5	26.6	24.8	26.3	28.1	26.9	27.8
18-R	134.2	Eel above Fish Creek (riffle)	NA	29.4	27.8	27.0	27.9	27.4	26.1	26.6	28.0	26.9	27.9
18-P	134.2	Eel above Fish Creek[2]	NA	27.4	24.3	22.2	21.4	21.9	23.6	23.7	23.5	19.4	17.9
19	126.1	Eel above Outlet Creek	28.0	29.5	27.2	26.7	28.0	27.3	26.5	26.1	27.6	26.7	27.6
20	–	Outlet Creek near mouth	26.7	28.8	26.3	25.1	26.1	26.4	25.8	25.2	27.1	25.7	NA
21	126	Eel below Outlet Creek	27.9	29.3	27.3	26.4	27.9	NA	26.5	26.3	27.7	26.6	27.6
22-R	122.3	Eel between Outlet Creek and Middle Fork Eel (riffle)	27.7	29.3	25.8	25.1	26.3	26.7	26.0	25.1	26.5	25.3	26.3
22-P	122.3	Eel between Outlet Creek and Middle Fork Eel (pool)	27.6	NA	25.4	23.5	25.2	26.6	26.0	24.2	26.3	24.4	25.6
23-R	119.3	Eel above Dos Rios (riffle)	27.5	29.2	25.8	25.5	26.9	26.7	26.1	25.2	26.8	26.0	26.7
23-P	119.3	Eel above Dos Rios (pool)	27.3	27.9	24.6	24.3	NA	NA	25.7	24.0	25.2	24.6	25.1
24	119.1	Eel above Middle Fork Eel	NA	29.2	25.6	NA	26.7	26.4	26.0	25.1	NA	26.2	25.6
24.1	–	Middle Fork Eel at Cable Creek	27.1	29.3	25.9	25.5	27.4	26.8	26.1	25.3	NA	26.5	27.5
24.2	–	Middle Fork Eel at Rowland Bar	NA	29.1	25.7	25.2	27.6	NA	26.1	25.6	27.1	26.3	27.1
25	118.9	Eel below Middle Fork	27.6	29.1	25.6	25.5	26.3	NA	26.2	25.3	26.6	24.0	25.6

Source: PG&E 2006–2016

[1] Probe calibration error reported for Eel below Scott Dam beginning in June (PG&E 2008), value may not be representative.

[2] Pool temperatures monitored at multiple depths to document thermal stratification. Values listed in table are for bottom depth only.

Notes: NA = not available
RM = River Mile
VAFS = Van Arsdale Fisheries Station

Table 3.3.2-4. Maximum weekly average temperature (MWAT) summary for Eel River and tributary locations included in PG&E's Annual Summer Water Temperature Monitoring Program, 2016–2023.

Site #	Eel River RM	Site Name	2016	2017	2018	2019	2020	2021	2022	2023
1	181	Eel above L. Pillsbury (Bloody Rock)	22.7	22.4	23.8	21.4	22.1	23.8	23.4	22.2
2	167.8	Eel below Scott Dam (PG&E E2 gage site)	22.7	22.8	19.1	21.0	21.1	22.5	20.0	21.7
3	164	Eel between the dams (Monkey Rock)	22.4	22.7	18.9	20.7	20.9	22.5	20.4	21.6
4	157.8	Eel above Cape Horn Dam	23.0	22.5	19.7	20.2	22.6	24.2	22.6	21.6
5	156.8	Eel at VAFS (pool)	23.3	22.2	21.4	NA	NA	NA	NA	NA
6-R	155.7	Eel below Cape Horn Dam (riffle)	23.3	22.2	22.6	21.2	NA	25.3	23.9	22.8
6-P	155.7	Eel below Cape Horn Dam (pool)	23.0	22.4	21.5	NA	NA	NA	NA	NA
7-P	154.2	Eel above Whitney Creek[1]	22.3	21.9	22.8	NA	NA	NA	NA	NA
8	153.1	Eel above Tomki Creek confluence	24.5	22.7	25.3	22.6	25.6	26.0	25.0	24.2
9	–	Tomki Creek near mouth	23.6	24.1	26.2	NA	25.6	NA	NA	NA
10	152.5	Eel below Tomki Creek confluence	24.6	NA	NA	NA	NA	NA	NA	NA
11-R	148.8	Eel below Thomas Creek (riffle)	25.3	24.0	26.6	23.7	26.5	26.8	26.3	25.3
11-P	148.8	Eel below Thomas Creek[1]	24.2	23.9	24.5	NA	NA	NA	NA	NA
12	147.2	Eel above Garcia Creek confluence	25.8	24.5	27.2	NA	NA	NA	NA	NA
13	147.1	Eel below Garcia Creek confluence	25.9	24.6	27.1	NA	NA	NA	NA	NA
14	145.9	Eel below Emandal	26.3	25.3	27.8	24.7	27.6	28.0	27.3	26.5
15-R	144.5	Eel near Hearst Bridge (riffle)	26.8	25.9	27.9	NA	NA	NA	NA	NA
15-P	144.5	Eel near Hearst Bridge (pool)	26.6	NA	27.9	NA	NA	NA	NA	NA
16-R	143.9	Eel below Hearst (riffle)	26.9	NA	NA	NA	NA	NA	NA	NA
16-P	143.9	Eel below Hearst (pool)	NA	NA	NA	NA	NA	NA	NA	NA
17	142.6	Eel at Ramsing Ranch	27.1	26.5	28.1	25.6	27.8	28.0	27.8	27.4

Site #	Eel River RM	Site Name	2016	2017	2018	2019	2020	2021	2022	2023
18-R	134.2	Eel above Fish Creek (riffle)	27.1	NA	NA	NA	NA	NA	NA	NA
18-P	134.2	Eel above Fish Creek[1]	25.5	NA	NA	NA	NA	NA	NA	NA
19	126.1	Eel above Outlet Creek	27.2	27.2	27.9	26.6	27.5	27.7	28.0	27.6
20	–	Outlet Creek near mouth	NA	26.8	26.4	NA	NA	NA	NA	NA
21	126	Eel below Outlet Creek	27.2	NA	NA	NA	NA	NA	NA	NA
22-R	122.3	Eel between Outlet Creek and Middle Fork Eel (riffle)	26.0	26.8	26.6	26.1	26.7	26.6	27.1	26.9
22-P	122.3	Eel between Outlet Creek and Middle Fork Eel (pool)	25.1	NA	25.9	NA	NA	NA	NA	NA
23-R	119.3	Eel above Dos Rios (riffle)	26.3	NA	NA	NA	NA	NA	NA	NA
23-P	119.3	Eel above Dos Rios (pool)	24.4	NA	NA	NA	NA	NA	NA	NA
24	119.1	Eel above Middle Fork Eel	26.3	26.6	27.3	25.9	27.2	27.2	27.4	26.9
24.1	–	Middle Fork Eel at Cable Creek	26.8	NA	NA	NA	NA	NA	NA	NA
24.2	–	Middle Fork Eel at Rowland Bar	26.8	26.8	27.6	26.0	27.5	27.2	27.6	NA
25	118.9	Eel below Middle Fork	25.8	26.7	27.0	25.9	27.5	27.0	27.5	NA

Source: PG&E 2016–2023
[1] Pool temperatures monitored at multiple depths to document thermal stratification. Values listed in table are for bottom depth only.
Notes: NA = not available
RM = River Mile
VAFS = Van Arsdale Fisheries Station

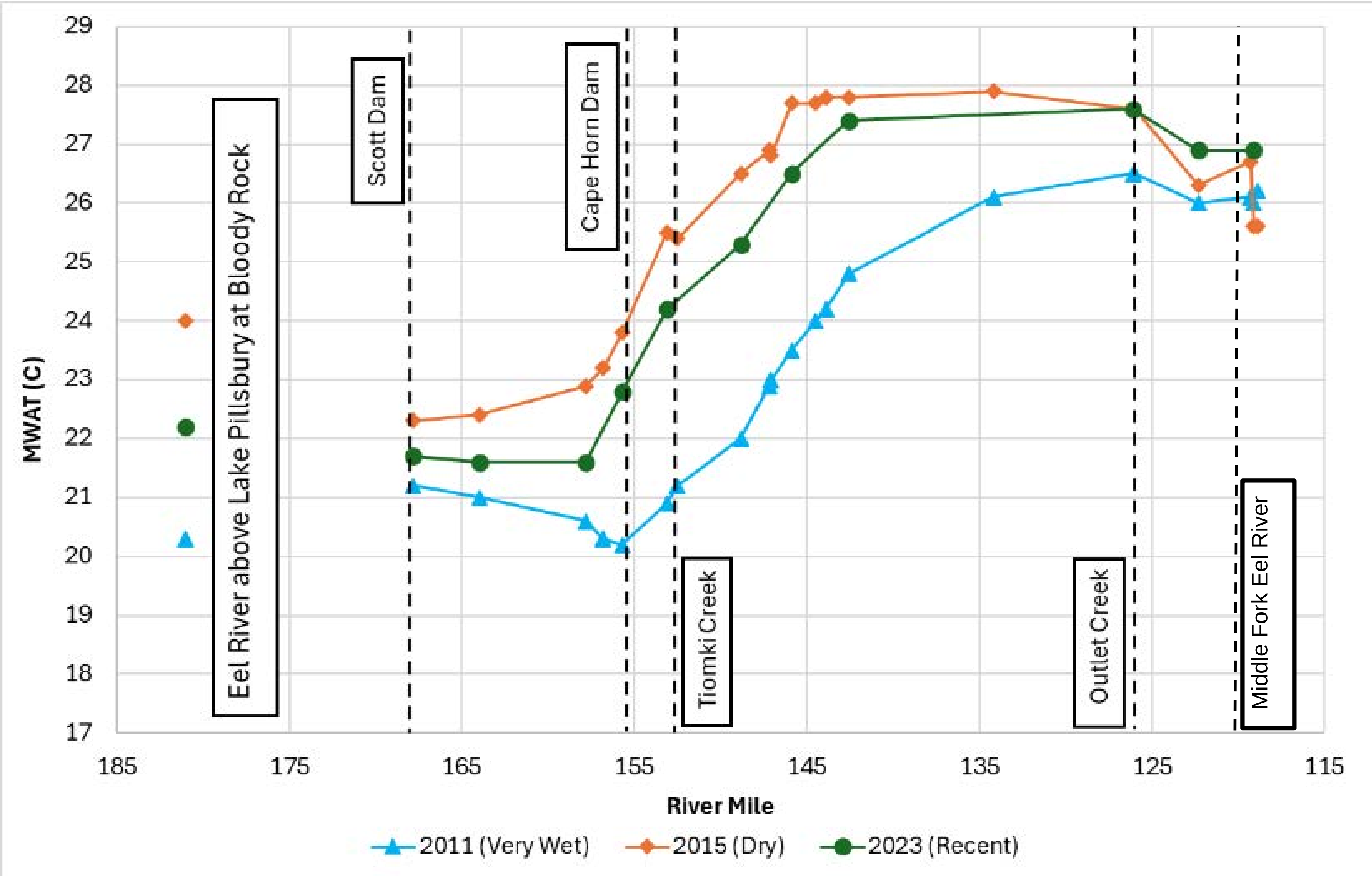
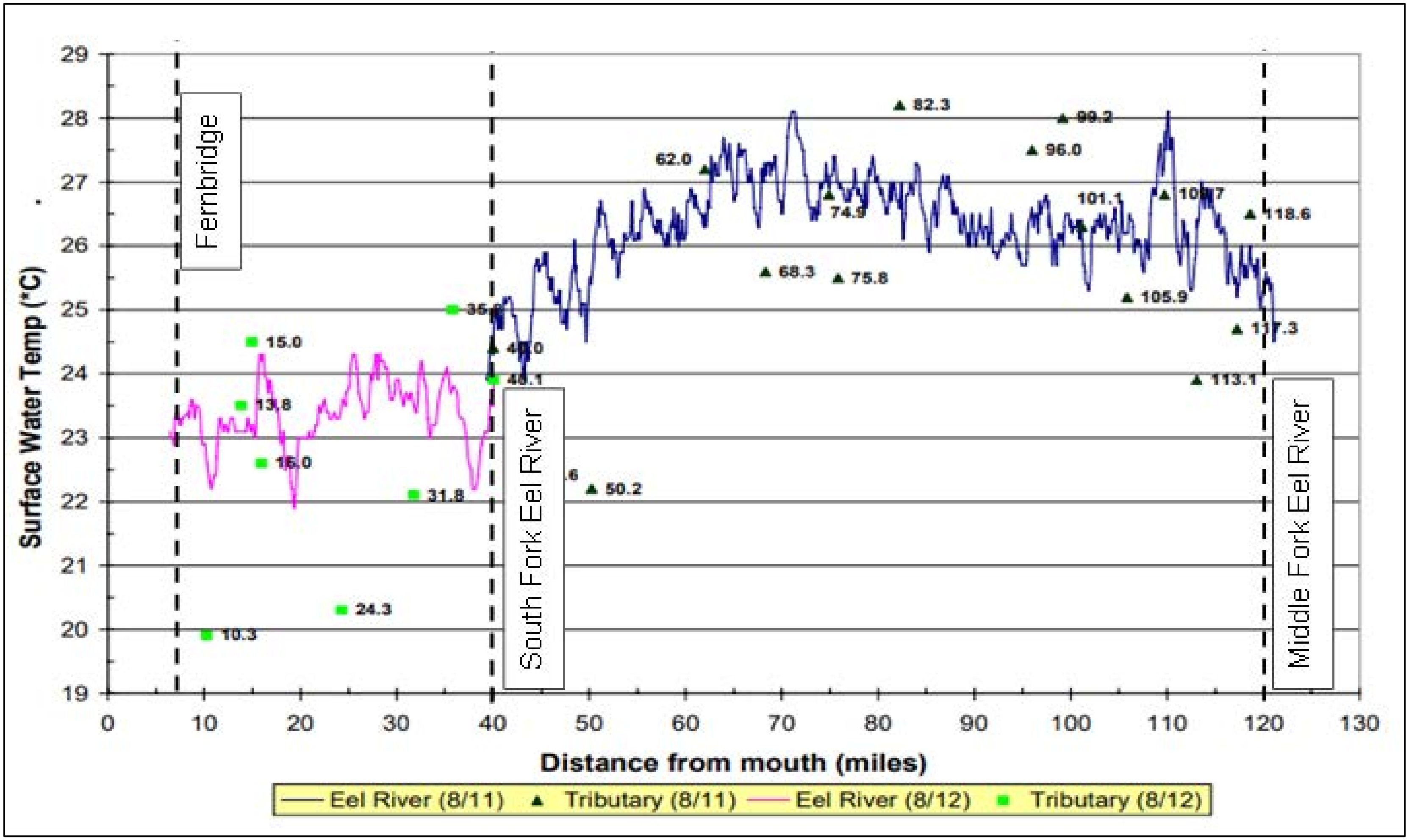
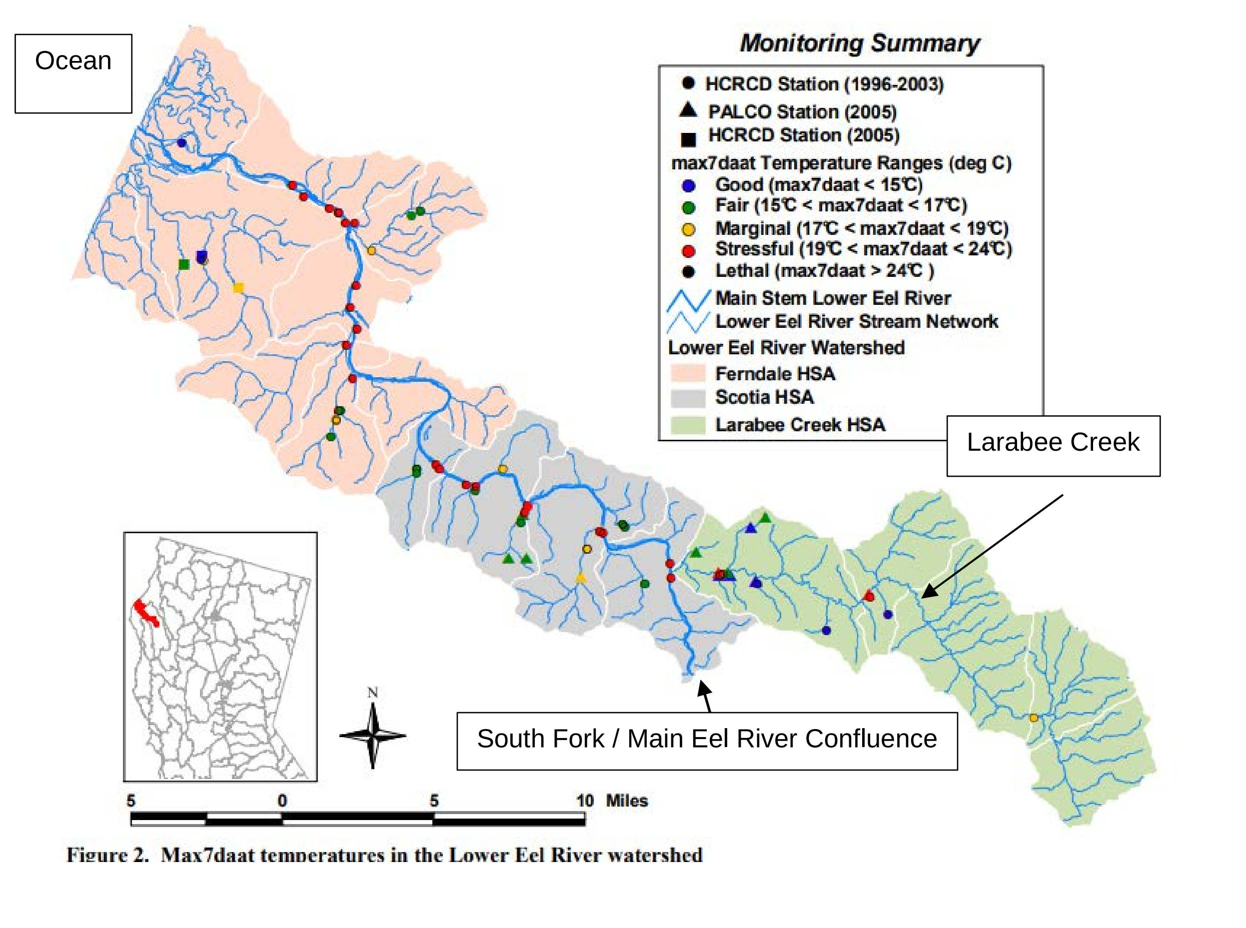


Figure 3.3.2-1. Longitudinal profiles of annual maximum weekly average temperature (MWAT) for non-pool habitats in the mainstem Eel River during three representative water years: 2011 (very wet), 2015 (dry), and 2023 (recent operations, seismic restrictions on Lake Pillsbury storage, wet water year type).



Source: Appendix B in USEPA 2007

Figure 3.3.2-2. Median sampled temperatures along the Eel River downstream from the Middle Fork Eel River confluence (afternoon August 11 and 12, 2008). Tributaries and other sampled inflows (e.g., springs/seeps, irrigation returns) are labeled on the profile by river mile.



Source: USEPA 2007

Figure 3.3.2-3. Maximum 7-day average temperatures (max7daat) in the Lower Eel River.

Lake Pillsbury

Reservoir water temperature profiles were collected in Lake Pillsbury near Scott Dam during the summer months from 2014 to 2023 (PG&E 2015–2024). Lake Pillsbury exhibited strong thermal stratification beginning in late spring that persisted into late summer or early fall. The surface water (epilimnion) was warm, and the bottom water (hypolimnion) was relatively cold. By late summer or early fall, the hypolimnetic water was typically depleted due to low-level releases into the Eel River and only the warm surface water remained. During the summer, the surface water of Lake Pillsbury reached between 25°C and 27°C by late June or early July (see Appendix 3.3.2-B for graphs of years 2014–2015 and 2017–2023). During June and July, the water temperatures deeper in the water column varied from approximately 10°C to 18°C. Based on data from the 2023 summer water temperature monitoring profile near Scott Dam, temperatures ranged from 21.0°C to 26.2°C (depending on time of year) at a depth of 1 meter (m) and ranged from 11.0°C to 22.0°C (depending on time of year) at a depth of 17 m (Figure 3.3.2-4).

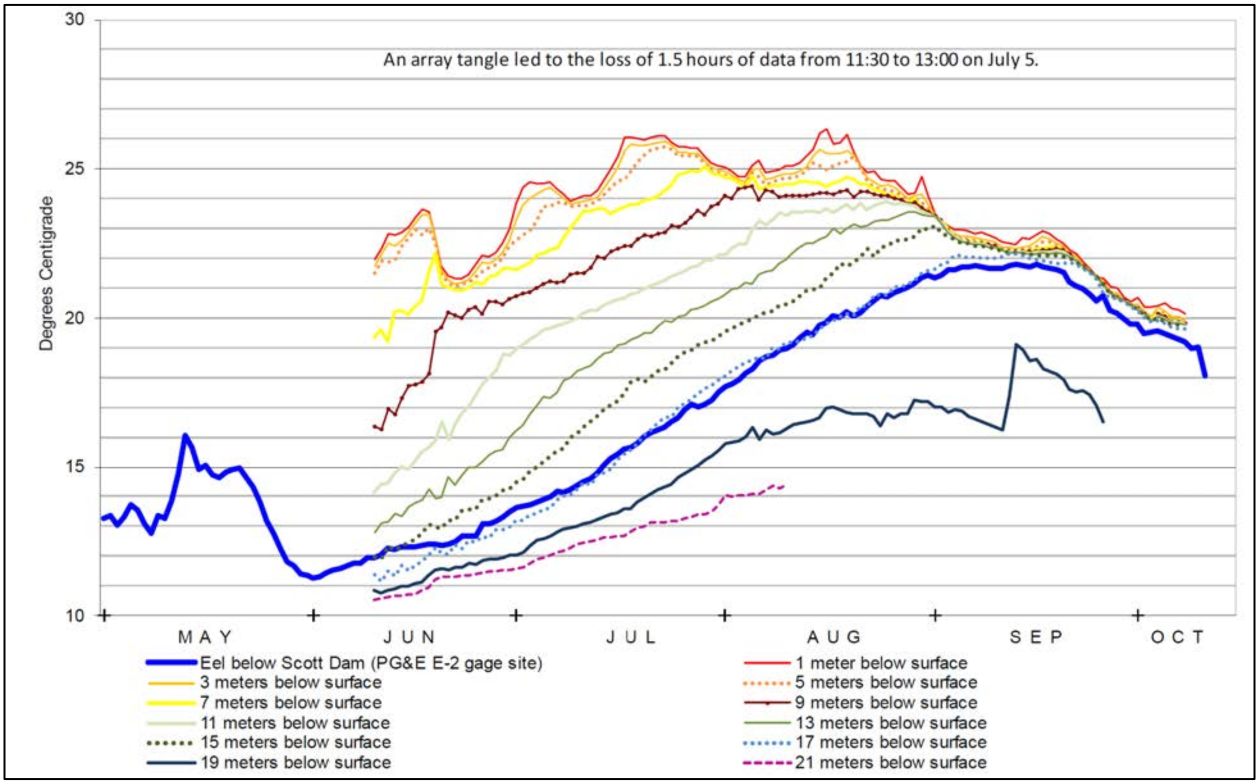
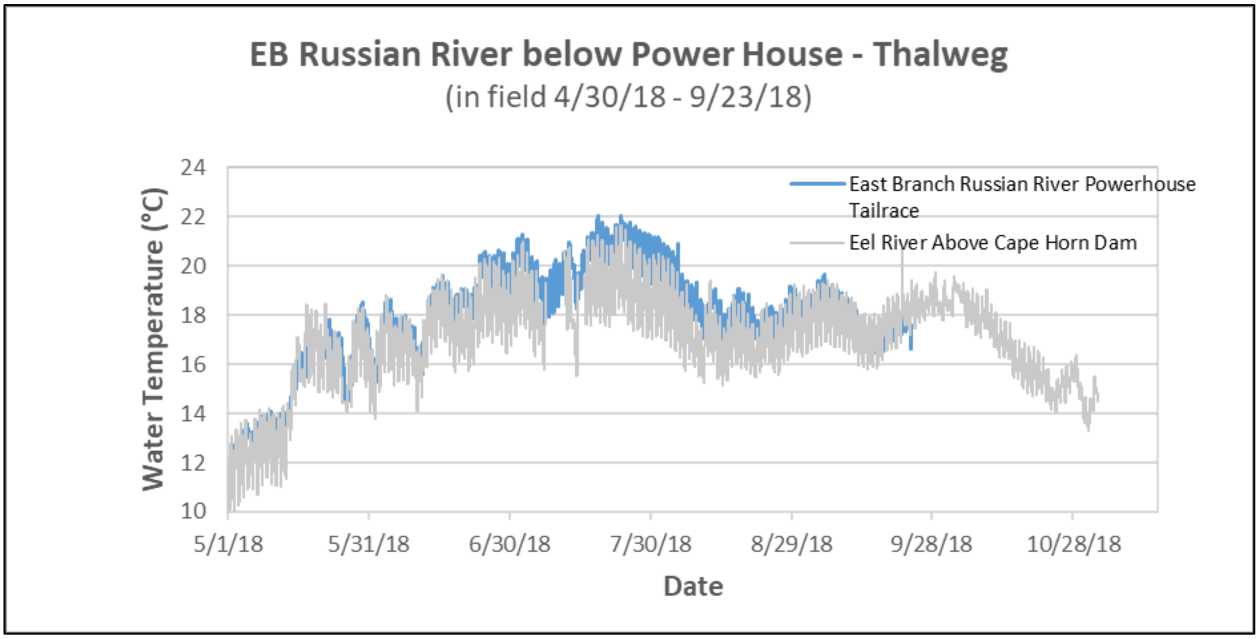
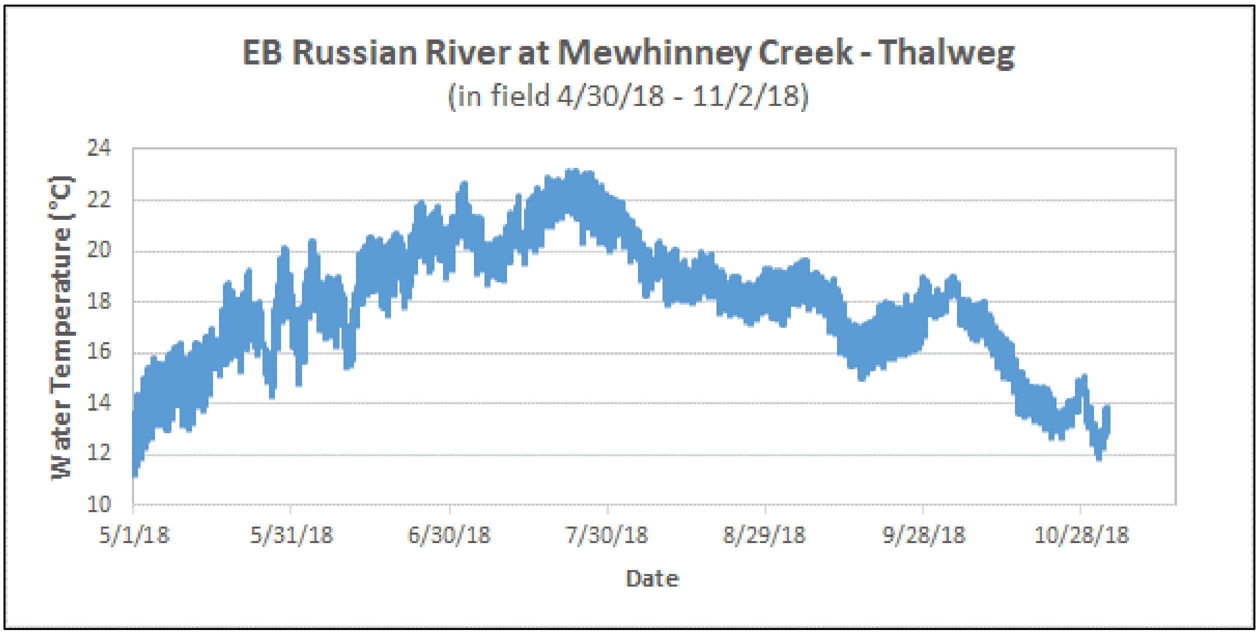


Figure 3.3.2-4. Daily mean summer water temperatures at selected depths in Lake Pillsbury near face of Scott Dam, 2023 water year.

East Branch Russian River

Water temperature monitoring in the East Branch Russian River is not required by the annual *Summer Water Temperature Monitoring Plan* (PG&E 2005). Available spot water temperature data near the Potter Valley Powerhouse ranged from 7.7°C (February) to 20.0°C (late June) during 2004 to 2005 (CEDEN 2016). Outflow water temperatures at the powerhouse tailrace were similar to those of the inflowing Eel River water from Van Arsdale Reservoir. During the relicensing studies in 2018 (PG&E 2019a), data were collected at two locations in East Branch Russian River, near the powerhouse tailrace and 5.5 mi. downstream near the confluence with Mewhinney Creek. Water temperatures from these sites and from the Eel River upstream of Cape Horn Dam are shown on Figure 3.3.2-5. Water temperatures at all three sites ranged from approximately 10°C in early May to approximately 22°C to 23°C in late July. Temperature in the East Branch Russian River near Mewhinney Creek was slightly warmer than at the powerhouse tailrace.





Source: PG&E 2019a

Figure 3.3.2-5. 2018 water temperature data collected in the East Branch Russian River near the powerhouse tailrace (also see Eel River above Cape Horn Dam) and 5.5 mi. downstream at the confluence with Mewhinney Creek.

Analytical and *In Situ* Water Quality Data

Extensive water quality data were collected by PG&E during the start of Project relicensing[3] (PG&E 2018a, 2019a). Seasonal water quality sampling was performed at 5 reservoir and 15 riverine sites during the spring runoff period (May 15–24, 2018) and the summer/fall low-flow period (September 18–27, 2018). Data collection occurred in the Eel River and Rice Fork River upstream of Lake Pillsbury, four locations in Lake Pillsbury, one location on the Eel River downstream of Lake Pillsbury, two locations in Van Arsdale Reservoir, ten locations between Cape Horn Dam and the Middle Fork Eel River, and two locations on the East Branch Russian River. The water quality data collection included:

- Seasonal *in situ* water quality sampling data (water temperature, DO concentration and saturation, SpCond, pH, turbidity, chlorophyll-a, Secchi depth, and phycocyanin [BGA-PC]) were collected at each reservoir and riverine site in May and September of 2018.
- Seasonal grab samples were collected in May and September of 2018 at the reservoir and riverine sites and analyzed for general chemistry, nutrients, algae, total and dissolved metals, and hydrocarbons. Hydrogen sulfide concentrations in Lake Pillsbury and in the reservoir outflow (Eel River) were also analyzed.
- Monthly water quality sampling at four Lake Pillsbury sites, two Lake Pillsbury inflow sites (Eel River and Rice Fork), and one Lake Pillsbury outflow site (Eel River) was completed in May, June, September, and October.[4] Lake Pillsbury was also sampled in November 2018.[5] *In situ* data were collected at one site below Van Arsdale Reservoir.
- Water temperature, DO, SpCond, pH, turbidity, chlorophyll-a, Secchi depth, and BGA-PC were measured and grab samples for laboratory analysis were collected in May, June, September, and October of 2018. The water grab samples were analyzed for nutrients, algae, biochemical oxygen demand (BOD), mercury, methylmercury, iron, and sulfides.

Historical suspended sediment data were collected on a daily basis between 1959 and 1980 at the following four USGS stations on the Eel River:

- USGS 11472150 Eel River near Dos Rios, CA (10/01/1966 to 09/29/1977)
- USGS 11472500 Eel River above Dos Rios, CA (10/05/1959 to 08/31/1965)
- USGS 11477000 Eel River a Scotia, CA (10/02/1959 to 09/29/1980)
- USGS 11475000 Eel River at Fort Seward, CA (10/02/1965 to 09/29/1976)

Eel River

PG&E's 2018 monitoring demonstrated that DO in the Eel River ranged from 7.5 to 11.2 mg/L and 79 to 109 percent saturation, pH ranged from 7.8 to 8.1, and SpCond ranged from 230 to 514

[3] The data were collected for the AQ 3 – Water Quality Technical Study.

[4] Water quality sampling was not completed in July and August of 2018 due to the Ranch Fire.

[5] The November sampling was conducted to capture post "overturn" water quality conditions in Lake Pillsbury

microSiemens per centimeter (µS/cm), and turbidity ranged from −0.4 to 2.1 nephelometric turbidity units (NTU). Chlorophyll-a concentrations ranged from −0.19 to 26.53 micrograms per liter (µg/L), and phycocyanin concentrations ranged from −0.01 to 6.19 µg/L (Table 3.3.2-5). Negative values for turbidity, chlorophyll-a concentrations, and phycocyanin concentrations are the result of instrument calibration error. Water quality generally met numeric Basin Plan objectives for general water quality parameters, including DO and pH.

Table 3.3.2-5. Summary of *in situ* water quality measurements in riverine sites.

Site Name	DO (mg/L)	DO % Sat	pH	SpCond (µS/cm)	Turbidity (NTU)	Chlorophyll-a		Phycocyanin	
						(RFU)	(µg/L)	(RFU)	(µg/L)
Inflow to Lake Pillsbury (Minimum)	7.5	79	7.8	230	–0.4*	–0.04*	–0.19*	–0.01*	–0.01*
Inflow to Lake Pillsbury (Maximum)	10.9	103	8.1	514	2.1	6.64	26.53	6.19	6.19
Eel River Scott Dam to Van Arsdale Reservoir (Minimum)	8.8	92	7.7	146	1.6	0.01	–0.06	0.08	0.11
Eel River Scott Dam to Van Arsdale Reservoir (Maximum)	11	106	8.0	202	6.2	0.18	0.72	0.24	0.26
Eel River Cape Horn Dam to Middle Fork Eel River (Minimum)	8.5	89	7.9	159	0.1	–0.02*	–0.1*	–0.03*	–0.01*
Eel River Cape Horn Dam to Middle Fork Eel River (Maximum)	11.2	109	8.6	359	3.3	2.5	9.9	2.09	2.13

Source: PG&E 2019a
* Negative values are likely a result of instrument calibration error.

Nutrient concentrations (e.g., nitrogen, phosphorus), chlorophyll-a, and BOD in riverine samples were all generally below detection limits or detected at low levels but below reporting limits (PG&E 2019a). The maximum concentration of both dissolved organic carbon and total organic carbon was 2.9 mg/L between Scott Dam and Van Arsdale Reservoir. Seasonal and monthly results from grab sample analysis are available in PG&E's *AQ-3 Water Quality Study Data Memorialization: Technical Study Summary* (PG&E 2019a).

Low concentrations of mercury and methyl mercury were detected in all samples. Levels at riverine sites ranged from 0.7 to 5.1 nanograms per liter (ng/L) and 0.02 to 0.76 ng/L, respectively. Iron and manganese levels at riverine sites ranged from 57 to 310 µg/L and from <8 µg/L to 300 µg/L, respectively (PG&E 2019a).

Total hardness and total alkalinity were greater at the Rice Fork and Eel River sites above Lake Pillsbury compared to the Lake Pillsbury, Eel River between Scott Dam and Middle Fork Eel River, and the East Branch Russian River sites (PG&E 2019a: Table AQ3-6).

Water quality data were collected in 2001 through 2019 under the SWAMP at three stations in the Eel River between Van Arsdale Reservoir and Dos Rios, two stations in the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino, and two stations in Lake Pillsbury (CEDEN 2024). Table 3.3.2-6 provides a tabular summary of the SWAMP data.

Table 3.3.2-6 Summary of SWAMP analytical water quality data collected in study area streams (three stations in the Eel River between Van Arsdale Reservoir and Dos Rios, two stations in the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino, and two stations in Lake Pillsbury).

Analyte/ Parameter	Threshold Criteria	Eel River Sites[1]			East Branch Russian River Sites[2]		
		Min	Max	Date Range	Min	Max	Date Range
General Water Quality							
DO (mg/L)	7.0[3]	5.10	15.5	Mar 2001–Sep 2019	8.5	12.3	Oct 2004–Sep 2019
DO (% Saturation)	–	80	151	Mar 2001–Sep 2019	88.9	115	Oct 2004–Sep 2019
pH (min/max)	6.5/8.5[3]	7.0	8.7	Mar 2001–Sep 2019	7.3	8.2	Oct 2004–Sep 2019
Specific conductance (µS/cm)	225[3] (Eel); 250[3] (Russian)	76	376	Mar 2001–Sep 2019	106	254	Oct 2004–Sep 2019
Salinity (ppt)	–	0.04	0.18	Sep 2005–Sep 2019	0.05	0.1	Aug 2006–Jul 2009
Total dissolved solids (mg/L)	140[3] (Eel); 150[3] (Russian)	27	400	Mar 2001–Sep 2017	86	130	Oct 2004–Jul 2009
Turbidity (NTU)	–	0.5	11.4	Mar 2001–Jul 2010	1.4	8.8	Oct 2004–Jul 2009
Minerals							
Alkalinity as $CaCO_3$ (mg/L)	–	34.7	130	Mar 2001–Jul 2010	45.1	90.9	Oct 2004–Jul 2009
Calcium (mg/L)	–	12.4	25	Mar 2001–May 2001	NA	NA	–
Chloride (mg/L)	250[4]	0.92	31	Mar 2001–Jul 2010	1.6	5.2	Oct 2004–Jul 2009
Hardness as $CaCO_3$ (mg/L)	–	28.4	193	Mar 2001–Jul 2010	53.4	95.1	Oct 2004–Jul 2009

Analyte/ Parameter	Threshold Criteria	Eel River Sites[1]			East Branch Russian River Sites[2]		
		Min	Max	Date Range	Min	Max	Date Range
Potassium (mg/L)	–	0.7	23.4	Mar 2001–Jul 2010	0.8	16.9	Oct 2004–Jul 2009
Silica as SiO_2 (mg/L)	–	6.4	12.6	Mar 2001–May 2001	NA	NA	–
Sodium (mg/L)	–	2.1	8..4	Mar 2001–Sep 2017	NA	NA	–
Sulfate (mg/L)	250[4]	1.5	45.8	Mar 2001–Sep 2017	4.0	10.6	Oct 2004–Jul 2009
Nutrients							
Ammonia as N (mg/L)	2.4–5.6[5]	0.006	0.022	Mar 2001–Jul 2010	0.013	0.033	Oct 2008–Jul 2009
Chlorophyll-a (µg/L)	–	0.048	6.3	Mar 2001–Jul 2010	0.3	2.0	Oct 2004–Jul 2009
Nitrate (mg-N/L)	10[3]	0.005	0.189	Feb 2002–Jul 2019	0.015	0.099	Oct 2004–Jul 2009
Nitrite (mg-N/L)	1[6]	0.002	0.020	Feb 2002–Jul 2019	0.003	0.003	Oct 2004–Jul 2009
Nitrogen total Kjeldahl (mg/L)	–	0.062	1.35	Feb 2002–Jul 2010	0.15	0.97	Oct 2004–Jul 2009
Total-N (mg/L)	–	0.189	1.54	Feb 2002–Jul 2019	ND	1.07	Oct 2004–Jul 2009
Orthophosphate (mg-P/L)	–	0.005	0.16	Mar 2001–Jul 2019	0.011	0.044	Oct 2004–Jul 2009
Phosphorus-Total (mg-P/L)	–	0.005	0.324	Mar 2001–Jul 2019	0.032	0.281	Oct 2004–Jul 2009
Trace Metals							
Aluminum (µg/L)	1,000[3,6]	2	9,375	Mar 2001–Jul 2010	14	5,367	Oct 2004–Jul 2009
Arsenic (µg/L)	50[3,6]	0.107	4.09	Feb 2002–Jul 2010	0.44	4.05	Oct 2004–Jul 2009
Boron (mg/L)	–	0.013	1.65	Feb 2002–Jul 2010	0.108	0.648	Feb 2005–Jul 2009
Cadmium (µg/L)	10[3,6]	0.002	0.07	Mar 2001–Jul 2010	0.01	0.04	Oct 2004–Jul 2009
Chromium (µg/L)	50[3]	0.10	28.6	Mar 2001–Jul 2010	0.25	22.8	Oct 2004–Jul 2009
Copper (µg/L)	1,000[4]	0.55	13.9	Mar 2001–Jul 2010	0.8	9.45	Oct 2004–Jul 2009

Analyte/ Parameter	Threshold Criteria	Eel River Sites[1]			East Branch Russian River Sites[2]		
		Min	Max	Date Range	Min	Max	Date Range
Iron (µg/L)	300[4]	372	2,780	Mar 2001–May 2001	NA	NA	–
Lead (µg/L)	50[3]	0.004	3.21	Mar 2001–Jul 2010	0.03	2.09	Oct 2004–Jul 2009
Magnesium (mg/L)	–	3.5	7.4	Mar 2001–May 2001	NA	NA	–
Manganese (mg/L)	0.05[4]	0.45	324	Feb 2002–Jul 2010	11.9	246	Oct 2004–Jul 2009
Mercury (ng/L)	2,000[3]	0.28	29.6	Mar 2001–Jul 2010	0.805	16.9	Oct 2004–Jul 2009
Nickel (µg/L)	100[6]	0.010	49.6	Mar 2001–Jul 2010	0.79	38.3	Oct 2004–Jul 2009
Selenium (µg/L)	10[3]	0.097	1.1	Feb 2002–Jul 2010	0.05	0.52	Oct 2004–Jul 2009
Silver (µg/L)	50[3]	0.01	0.15	Feb 2002–Jul 2010	0.005	0.01	Oct 2004–Jul 2009
Zinc (µg/L)	5,000[4]	0.04	43.6	Mar 2001–Jul 2010	0.25	35.5	Oct 2004–Jul 2009
Organics							
PCBs (µg/L)[7]	0.014	0.001	0.001	Feb 2002–Jul 2010	NA	NA	–

Source: CEDEN 2024

1 Eel River includes stations 111ER7910 downstream of Van Arsdale Reservoir, 111ER7314 near Hearst, and 111ER6140 above Dos Rios.

2 East Branch Russian River includes stations 114EFRRPH at Powerhouse, 114CE0283 above Cold Creek, and 114EFRR20 at Hwy 20.

3 Basin Plan (NCRWQCB 2018): min. objective for DO mg/L; min. and max. objectives for pH; 50% upper limit objectives for SpCond and total dissolved solids; and potable water maximum contaminant level (MCL) for nitrate, aluminum, arsenic, cadmium, chromium, lead, mercury, selenium, and silver.

4 Title 22 Secondary MCL for tastes and odors.

5 Criterion maximum concentration for aquatic toxicity as defined by USEPA (2000a, 2001, 2013), criteria reported over 15–26°C, a local 45–190 mg/L range in hardness as $CaCO_3$, and assuming pH 8.0.

6 Title 22 MCL when it is more stringent than MCL for potable water supply listed in Basin Plan (NCRWQCB 2018). Title 22 primary MCL for arsenic = 10 mg/L and cadmium = 5 mg/L and secondary MCL for aluminum = 200 mg/L.

7 Criterion continuous concentration for total polychlorinated biphenyls (PCB) (USEPA 1999).

Notes: NA = not available
ND = non-detect

Suspended sediment data collected from 1959 through 1980 on the Eel River above the Middle Fork Eel River and in the Lower Eel River are shown on Figures 3.3.2-6 and 3.3.2-7, respectively (USGS 2024). An estimate of turbidity is also provided using relationships between suspended sediment and turbidity developed in Brown and Ritter (1971) for the Eel River at Scotia and the Eel River at Fort Seward. Brown and Ritter (1997) expressed turbidity based on silicon units, and a multiplier of 7.5 was used to convert these units to turbidity expressed as NTU (Figure 3.3.2-6 and Figure 3.3.2-7).

Turbidity levels at the upstream Eel River locations had a median turbidity of 86 NTU at the Eel River above Dos Rios (1960–1965) and 25 NTU at the Eel River near Dos Rios (1966–1977). High-turbidity events occurred frequently at these locations with maximum turbidity typically between 5,000 to 10,000 NTU (maximum recorded turbidity was 16,617 NTU). These high-turbidity events coincided with high flow events.

Turbidity levels at the downstream Eel River locations had a median turbidity of 70 NTU at the Eel River at Scotia (1959–1980) and 87 NTU at the Eel River at Fort Seward (1956–1976). High-turbidity events occurred frequently at these locations with maximum turbidity typically between 10,000 to 20,000 NTU (maximum recorded turbidity was 29,125 NTU). These high-turbidity events coincided with high flow events.

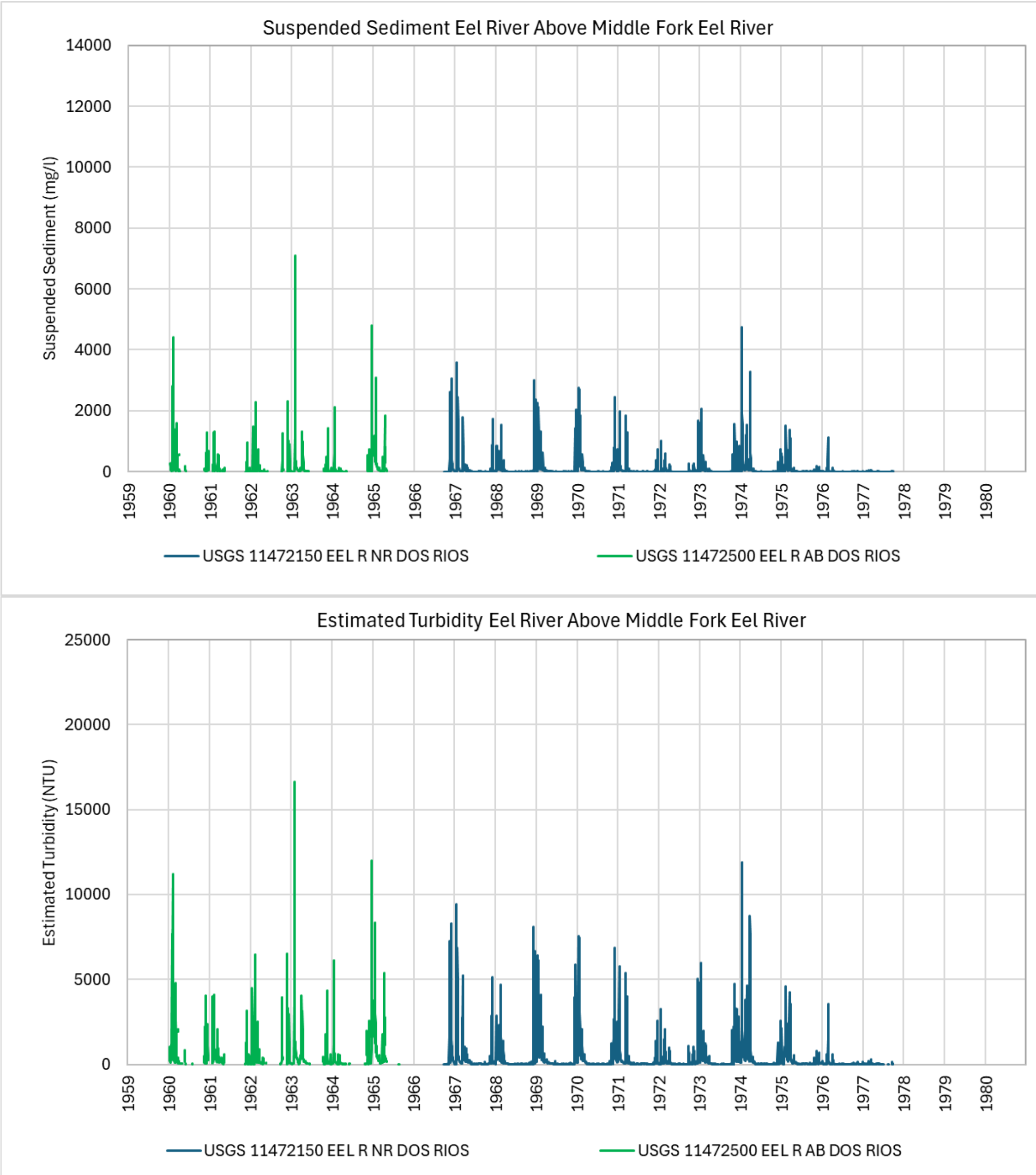


Figure 3.3.2-6. Suspended sediment (top) and estimated turbidity (bottom) at USGS 11472150 (Eel River near Dos Rios) and USGS 11472500 (Eel River above Dos Rios) from 1960 through 1977.

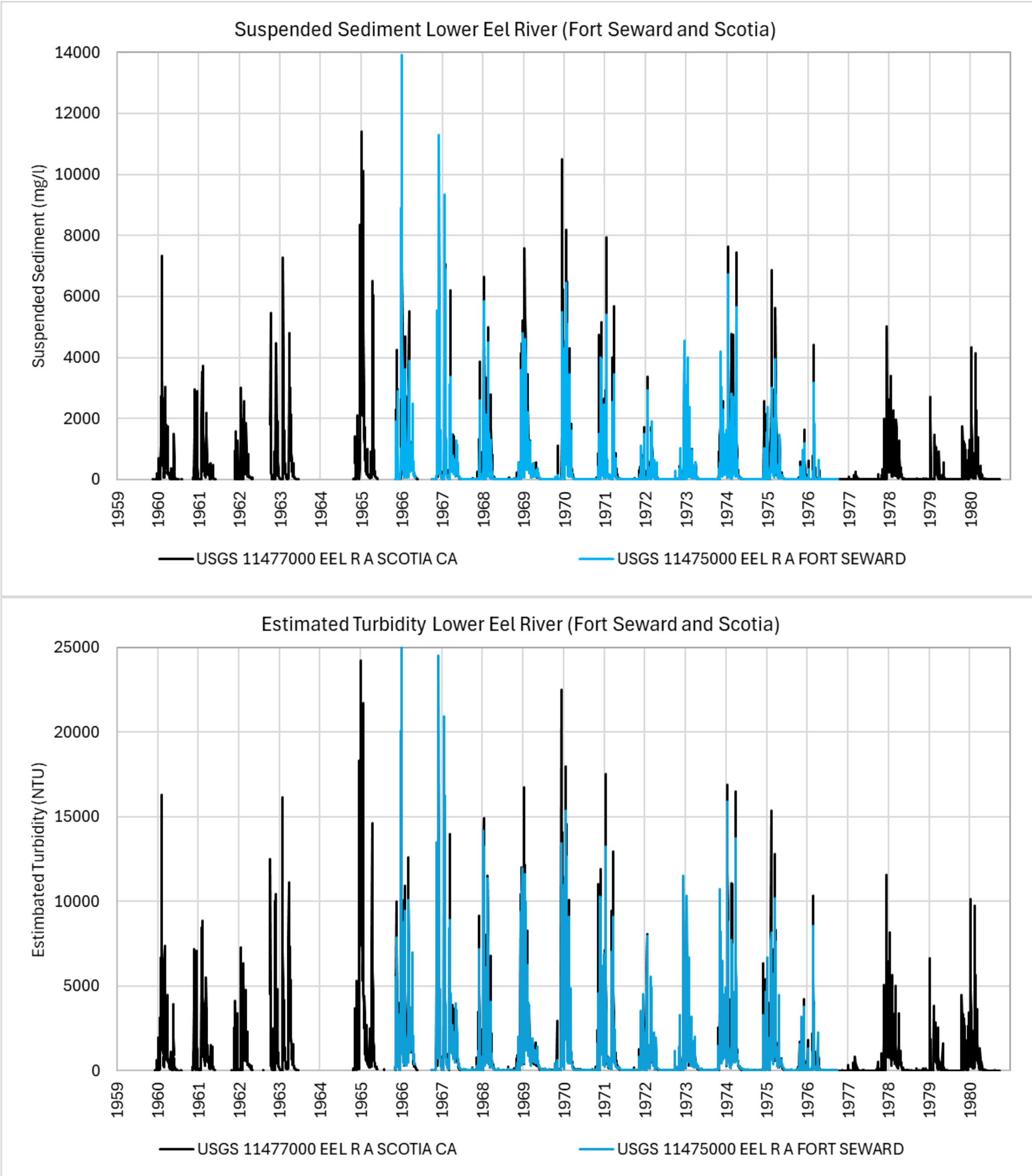


Figure 3.3.2-7. Suspended sediment (top) and estimated turbidity (bottom) at USGS 11477000 (Eel River at Scotia, CA) and USGS 11475000 (Eel River at Fort Seward) from 1959 through 1980.

Based upon historical information, water quality in the Eel River between Lake Pillsbury and the Middle Fork Eel River at Dos Rios generally met numeric Basin Plan objectives for general water quality parameters, including DO and pH, with total dissolved solids and conductivity meeting objectives from Title 22 of the California Code of Regulations (drinking water standards) (Table 3.3.2-6). Although the Basin Plan does not contain specific numerical water quality objectives for nutrients (e.g., nitrate and orthophosphate), measured levels were generally below regional reference values (USEPA 2000b). Similarly, although the Basin Plan contains no specific numerical objectives for chemical constituents or toxicity, concentrations of ammonia and most trace metals were below California Toxics Rule limits (USEPA 2000a, 2001, 2013) except for aluminum in both the Eel River and the East Branch Russian River and iron in the Eel River (see Table 3.3.2-6).

Aluminum is on the 303(d) list for the Middle and Lower Eel River and is recommended for the Upper Main Eel River based on 9 of 43 samples from the mainstem exceeding the objective for MUN (municipal and domestic supply) beneficial use (SWRCB 2024: Appendix B). The source is unknown.

Lake Pillsbury

Historical water quality data for Lake Pillsbury were reported as part of a national eutrophication survey conducted by USEPA in 1975 (USEPA 1978) and an initial feasibility study for a Lake Pillsbury hypolimnion aeration system in 1982 (Ellison 1982). Both reported Lake Pillsbury as eutrophic with diminished hypolimnetic DO levels during summer stratification. The 1975 USEPA survey also reported an observed algal bloom in the Rice Fork Arm of the reservoir in March and included a personal communication citation stating that fish kills were reported to be a problem in the lake.

Water quality in Lake Pillsbury follows similar patterns as other lakes in the region, with thermal stratification during summer and periods of DO depletion near the reservoir bottom. Temperature, DO, and pH profile data collected in Lake Pillsbury under SWAMP during fall of 2001 and spring of 2002 and 2003 (CEDEN 2016) are summarized on Figure 3.3.2-8 (note that Station 2 is located near Scott Dam and Station 1 is located approximately 0.75 mi. to the northeast of Station 2 in the Eel River arm of the reservoir). Information on historical temperature and DO profiles is provided in Ellison (1982).

Water quality monitoring data collected in Lake Pillsbury in 2018 were consistent with data collected in earlier studies (PG&E 2019a). The main conclusions of this study were as follows:

- Seasonal thermal stratification and hypoxia occurred in the Lake Pillsbury Arm (Site LP1) and Lake Pillsbury near Scott Dam (Site LP3) (PG&E 2019a: Table AQ 3-5 and Attachment A). This may have implications for the production of hydrogen sulfide, internal cycling of algal nutrients, as well as the production of trace metals affected by oxidation-reduction conditions.
- In Lake Pillsbury, nutrients and chlorophyll-a concentrations were highest during September and October and BOD was highest in September. Nutrient concentrations

(i.e., ammonia, total Kjeldahl nitrogen, orthophosphate, and total phosphorus) were generally highest in the bottom waters at Lake Pillsbury near Scott Dam (Site LP3) (PG&E 2019a: Table AQ3-7).

- Low levels of mercury and methylmercury concentrations were detected in all samples collected during seasonal and monthly sampling efforts. Concentrations were highest during October in the bottom waters at Lake Pillsbury near Scott Dam (Site LP3) (PG&E 2019a: Table AQ3-8).
- Hydrogen sulfide gas was detected (10.2 parts per million [ppm]) during September, and sulfide was quantifiable (0.16 mg/L) during October 2018 in the hypolimnion (bottom) of Lake Pillsbury near Scott Dam (Site LP3) (PG&E 2019a: Table AQ3-18).

More recent DO profiles were collected in Lake Pillsbury as part of the Summer Water Temperature Monitoring Program from 2020 through 2023 (PG&E 2023). Appendix 3.3.2-C provides maximum, minimum, and mean DO measurements at selected depths in Lake Pillsbury near the face of Scott Dam for 2020 through 2023. Generally, surface DO stays above 8 to 9 mg/L until mid/late August, at which point it declines to a daily mean value of between 4 and 5 mg/L through the end of October. Bottom DO concentrations steadily decline from close to surface concentrations in early May to 0 mg/L by early to mid-July most years. DO concentration profiles for 2023 are provided on Figure 3.3.2-9.

Only limited historical analytical chemistry data were identified for Lake Pillsbury beyond DO and pH. Extended periods with elevated turbidity have been reported due to fine-grained clays that stay in suspension for extended periods (NCRWQCB 2018).

East Branch Russian River

East Branch Russian River water is primarily diverted from the Eel River. In 2018, PG&E collected seasonal general chemistry (e.g., total suspended solids, total dissolved solids, calcium, magnesium, total hardness, alkalinity), nutrients, mercury, various metals, and oils/solvents data at two locations on the East Branch Russian River (PG&E 2019a). No water quality exceedances were observed.

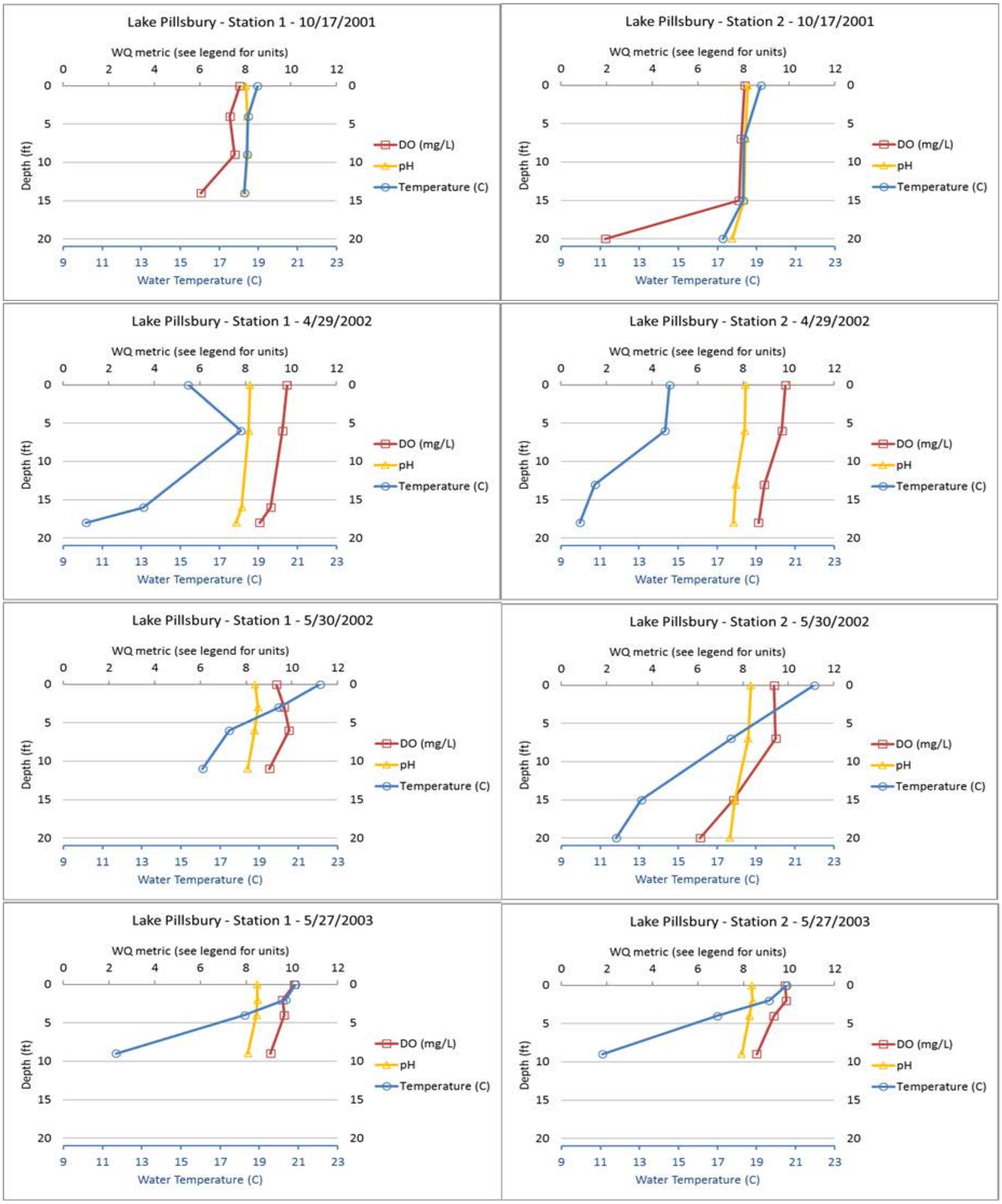
Table 3.3.2-6 reports SWAMP analytical water quality data from two locations on the East Branch Russian River (at the powerhouse and upstream of Cold Creek). Water quality generally met numeric Basin Plan objectives for general water quality parameters, including DO and pH, with total dissolved solids and conductivity meeting objectives from Title 22 of the California Code of Regulations (drinking water standards). The maximum aluminum concentration recorded was high, like in the mainstem Eel River, with a maximum value of 5,367 µg/L (criteria are 1,000 µg/L). Manganese exceeded the Title 22 secondary maximum contaminant level (MCL) for tastes and odors.

Bacterial Indicator Sampling

Bacteriological monitoring was carried out in 2018 at three locations in Lake Pillsbury, one location on the Eel River, and one location in Van Arsdale Reservoir (PG&E 2019a). Samples were collected on 5 days between June 18, 2018, and July 16, 2018. Fecal coliform concentrations were low (geometric mean <20 most probable number/100 mL). The concentrations were highest at Van Arsdale beach below the bridge (Site VA1) (PG&E 2019a: Table AQ3-13).

A test carried out by the California Department of Fish and Wildlife (CDFW) in 2023 indicated the water supply at Van Arsdale Fish Station (taken from the Eel River) tested positive for total coliform but negative for *Escherichia coli* (personal communication, Allan Renger, Fisheries Supervisor, Fortuna, California, CDFW, to Andrew Anderson, Aquatic Biologist, PG&E, June 16, 2023).

Sampling for bacteria in the East Branch Russian River by the NCRWQCB identified no exceedances of *E. coli* criteria but did show exceedances for Enterococci bacteria and Bacteroides bacteria (NCRWQCB 2018; Table 3.3.2-7).



Source: CEDEN 2016

Figure 3.3.2-8. Water quality and temperature profiles in Lake Pillsbury during 2001, 2002, and 2003 in the Eel River arm (Station 1) and near Scott Dam (Station 2).

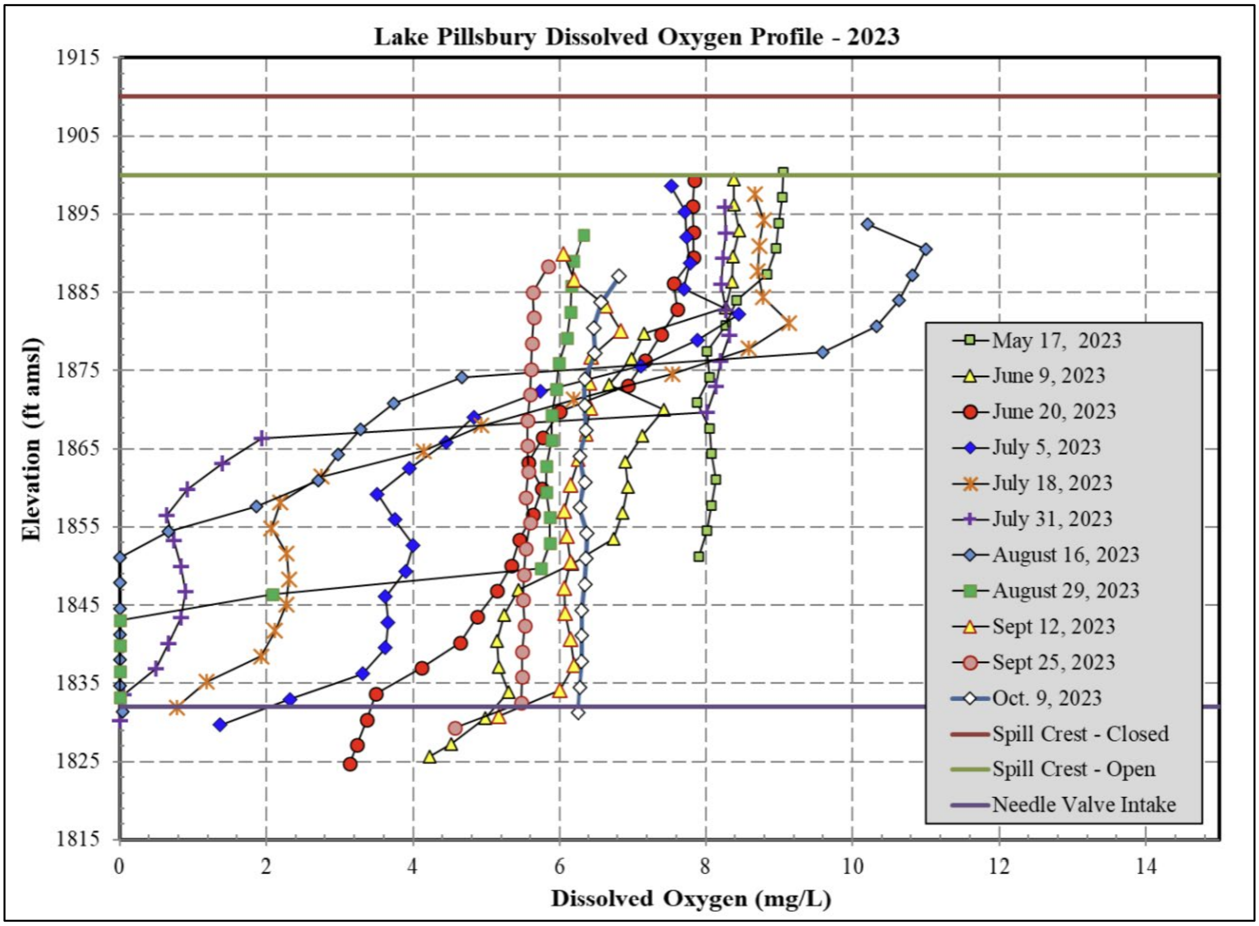


Figure 3.3.2-9. Dissolved oxygen profiles in Lake Pillsbury in 2023 near Scott Dam.

Table 3.3.2-7. Bacteria analysis from the East Branch Russian River.

Parameter	Number of 30-day Periods Sampled	Number of Periods that Exceed Geometric Mean or Statistical Threshold Value Targets	Median Human-specific Bacteroides (Gene Copies/ 100 mL)	Number of Measurements	Number of Measurements >60 Gene Copies/ 100 mL
Human-specific Bacteroides	NA	NA	5,949	3	3
Enterococci Bacteria	1	1	NA	NA	NA
E. coli Bacteria	1	0	NA	NA	NA

Source: NCRWQCB 2018
Note: NA = Not Available

Cyanobacteria and Toxin Sampling

In recent years, there has been a state-wide increase in the frequency and severity of cyanobacterial (i.e., blue green algae) blooms. Cyanobacteria produce a wide range of bioactive substances, several of which are toxic to humans and animals. Anatoxin-a is an alkaloid neurotoxin produced by some species of cyanobacteria and is one of the most toxic of the cyanobacterial toxins. Exposure to high levels of the toxin can result in cyanosis, convulsions, cardiac arrhythmia, respiratory paralysis, and death. Exposure to the toxin is primarily through ingestion directly from drinking water or indirectly during recreation.

During the summers of 2013 through 2015, the University of California studied the spatial and temporal patterns of cyanotoxins in the Eel River Watershed (Bouma-Gregson et al. 2018). Seventeen monitoring locations were included in the study, with nine sites on the mainstem Eel River and lower Eel River. The results of this study indicated widespread distribution of anatoxin-a in the Eel River Watershed. Anatoxin-a was not detected at the mainstem Eel River data collection location (MS1789) in 2013; however, it was detected at this site in 2014 in 45 percent of the Solid Phase Adsorption Toxin Tracking (SPATT) samplers. Over the same 2-year study period, two sampling locations on the Lower Eel River, LE9357 and LE7908, detected anatoxin-a in 25 percent and 50 percent of their SPATT samplers, respectively. Other locations along the mainstem were monitored in 2015. It was observed that SPATT cyanotoxin levels peaked in mid-summer in warm mainstem reaches of the watershed.

Because the NCRWQCB had received reports of nuisance blooms, algal scums, animal illnesses, and, on occasion, human health impacts within the North Coast region, PG&E conducted sampling during the summer of 2016 at several sites in the study area including:

- Site 1: Eel River near Trout Creek Campground (Mendocino County, California)
- Site 2: Lake Pillsbury near the Pillsbury Pines Boat Ramp (Lake County, California)
- Site 3: Lake Pillsbury near the Fuller Grove Boat Ramp (Lake County, California)
- Site 4: Lake Pillsbury near the future boat ramp south of Lake Pillsbury Resort (Lake County, California)

PG&E initiated sampling for anatoxin-a at these sites in late summer of 2016. As shown in Table 3.3.2-8, sample results indicated positive detections of anatoxin-a in Lake Pillsbury between late-August and mid-October 2016. As a result, “Caution” signs were posted at PG&E recreation areas and selected public facilities in conformance with the voluntary California CyanoHAB Network (CCHAB Network) guidance documents. A health advisory for Lake Pillsbury was released by the CCHAB Network. By late October, anatoxin-a was no longer detected and bloom conditions were determined to be absent at the Lake Pillsbury sites. “Caution” signs were removed in accordance with the CCHAB Network guidance document. Anatoxin-a was not detected in the Eel River at Trout Creek Campground in August, so no further sampling occurred at this site.

Table 3.3.2-8. 2016 Anatoxin-a sampling results in Lake Pillsbury.

Site	Sample Date	Anatoxin-a Test Results
1	8/22/2016	Negative (0.00 ppb)
2	8/24/2016	Positive (1–2.5 ppb)
	8/31/2016	Positive (0.4–1.0 ppb)
	9/14/2016	Positive (0.4–1.0 ppb)
	9/28/2016	Positive (<0.4 ppb)
	10/13/2016	Negative (non-detect)
	10/26/2016	Negative (non-detect)
3	8/24/2016	Positive (0.4–1.0 ppb)
	8/31/2016	Positive (0.0–0.4 ppb)
	9/14/2016	Positive (0.4–1.0 ppb)
	9/28/2016	Negative (non-detect)
	10/13/2016	Positive (<0.4 ppb)
	10/26/2016	Negative (non-detect)
4	8/31/2016	Negative (0.00 ppb)
	9/14/2016	Negative (0.00 ppb)

Source: Garcia and Associates (GANDA) 2016
Note: ppb = parts per billion

Surface water samples were collected in June, September, and October of 2018 at three locations in Lake Pillsbury, one location on the Eel River, and one location in Van Arsdale Reservoir (PG&E 2019a). Cyanobacteria toxins (i.e., total microcystins, anatoxin-a, and cylindrospermopsin) were not detected in Lake Pillsbury or in the Eel River downstream of Scott Dam to Van Arsdale Reservoir (PG&E 2019a: Table AQ 3-15).

Testing carried out in Lake Pillsbury by NCRWQCB staff on June 23, 2021, showed low levels of anatoxins (0.20 µg/L) at the Lake Pillsbury Resort (personal communication, Michael Thomas, NCRWQCB, Edward Cheslak, Senior Consulting Scientist, PG&E June 30, 2021). Testing carried out in Lake Pillsbury in 2023 was negative for anatoxin-a (Otten 2023). Testing conducted on 10/16/2024 detected cyanobacteria in Lake Pillsbury, and the California Northcoast Regional Water Quality Control Board recommended a lake-wide “Danger” status (CWQMC 2024).

Fish Tissue Mercury Sampling

Eel River

Sacramento pikeminnow (*Ptychocheilus grandis*) mercury concentrations in the Eel River downstream of Lake Pillsbury were sampled in 2018 as part of Project relicensing studies (PG&E 2019a). Twelve Sacramento pikeminnow were collected from the Eel River at locations upstream of Bucknell Creek and near Trout Creek. All fish were captured during an electrofishing effort on October 10, 2018. Tissue concentrations were generally greater than 0.2 microgram per cubic gram (µg/g)[6] (0.2 mg/kilogram [mg/kg]) wet weight (Table 3.3.2-9, PG&E 2019a).

Table 3.3.2-9. Eel River below Lake Pillsbury Sacramento pikeminnow tissue mercury results.

Species	Sample Date (2018)	Station	Total Mercury (µg/g [wet weight])	Moisture (percent)	Sex	Fish Length (mm)			Fish Weight (g)
						SL	FL	TL	
Sacramento Pikeminnow (*Ptychocheilus grandis*)	10/10	Eel River – Upstream of Bucknell Creek	0.80	78	F	305	341	364	380
			2.15	81	F	280	421	459	701
			0.94	79	F	349	333	419	559
			0.65	78	F	251	284	304	222
			0.74	79	F	269	306	331	282
			0.42	78	F	274	301	324	272
			0.71	79	M	265	294	319	235
			0.29	78	F	240	272	294	191
			1.60	78	F	377	415	448	657
		Eel River – near Trout Creek	0.88	79	M	268	305	325	255
			0.70	79	F	261	299	320	245
			1.46	79	F	310	350	373	379
		MDL	***0.003***	–	–	–	–	–	–
		RL	***0.009***	–	–	–	–	–	–

Source: PG&E 2019a
Notes: µg/g = microgram per gram
F = female
FL = fork length
g = grams
M = male
MDL = method detection limit
mm = millimeter
RL = reporting limit
SL = standard length
TL = total length

[6] California statewide water quality objective for methylmercury in sportfish is 0.2 mg/kg wet weight (SWRCB 2017).

Lake Pillsbury

Sampling of tissue taken from Lake Pillsbury fish detected high concentrations of mercury, averaging 1.31 µg/g in 350 millimeter (mm) largemouth bass (*Micropterus salmoides*), and the highest concentration for an individual fish (4.08 µg/g in a 559 mm largemouth bass) in statewide sampling (Davis et al. 2009). Consequently, Lake Pillsbury is designated as impaired for mercury on the California 303(d) list. Historical sampling for methyl tert-butyl ether (MTBE; banned in 2004) found levels well below health advisory levels (CEDEN 2024).

Tissue samples from sportfish (including rainbow trout [*Oncorhynchus mykiss*], largemouth bass, and bluegill [*Lepomis macrochirus*]) collected in Lake Pillsbury during PG&E's relicensing studies in 2018 were sent to the Moss Landing Marine Laboratory's Marine Pollution Studies Laboratory (Moss Landing, California) and analyzed for total mercury using a modified USEPA Method 7473. Thirty-two sportfish tissue samples were collected from Lake Pillsbury, including the following species: 10 bluegill, 12 largemouth bass, and 10 Sacramento pikeminnow. All fish were captured during the fish population field effort between September 24 and 27, 2018.

Total mercury concentrations in Lake Pillsbury sportfish tissue were generally greater than 0.2 µg/g (0.2 mg/kg) wet weight (Table 3.3.2-10, PG&E 2019a).[7]

Lake Mendocino

Lake Mendocino is designated as impaired for mercury on the California 303(d) list. Seven samples exceeded the sportfish objective of 0.2 mg/kg (SWRCB 2024: Appendix B).

Sedimentation/Siltation

The lower, middle, and upper Eel River sections are on the 303(d) impaired waters list for sedimentation/siltation, and USEPA has developed sediment TMDLs for each of the river sections (USEPA 2004, 2005, 2007). Brown and Ritter (1971) estimated the Eel River has the highest recorded average annual suspended-sediment yield per square mile of drainage area of any river of its size or larger in the United States. The yield, in tons per square mile, was more than 15 times that of the Mississippi River and more than four times that of the Colorado River.

The Eel River basin is underlain almost entirely by the sedimentary rocks of the Franciscan Formation. Weathering of the Franciscan Formation has produced highly erodible material. The climate of the basin is one of the wettest in California. Heavy rains fall during the winter months. The combination of geology, soil types, steep slopes, and heavy precipitation produces slumps and landslides, which contribute heavily to the sediment yield of the basin.

Brown and Ritter (1971) found that the Eel River discharged an average suspended load of more than 31 million tons per year as measured at Scotia, the farthest downstream gaging station. All parts of the basin contributed to the suspended sediment discharge at Scotia, although about two-thirds of the material came from the central one-third of the drainage area. The Eel River above

7 California statewide water quality objective for methylmercury in sportfish is 0.2 mg/kg, wet weight (SWRCB 2017).

its confluence with the Middle Fork Eel River contributed about 6 percent of the annual suspended load at Scotia, and the Middle Fork drainage added about 13 percent. An additional 13 percent came from the South Fork Eel River drainage. The remaining 68 percent of the annual suspended load was derived from the mainstem of the Eel River between the South Fork and Middle Fork tributaries. Most of the suspended sediment was moved by high flows, which occurred an average of 10 percent or less of the time. With few exceptions, 50 percent or more of the annual suspended load at each station was carried in fewer than 6 days during the water year (Brown and Ritter 1971). Typically, turbidity and the concentration of suspended sediment in the Eel River follow a linear relation, which persists throughout the range of measured values of these two variables.

Table 3.3.2-10. Lake Pillsbury sportfish tissue mercury results.

Species	Sample Date (2018)	Site ID[1]	Total Mercury (µg/g [wet weight])	Moisture (percent)	Sex	Fish Length (mm)			Fish Weight (g)
						SL	FL	TL	
Bluegill (*Lepomis macrochirus*)	9/24	GLP-3	0.42	78	M	191	217	226	295
	9/25	GLP-1	0.49	78	M	199	225	236	370
			0.48	79	F	186	209	221	320
			0.43	80	F	191	215	231	335
			0.55	80	M	191	215	231	360
			0.40	80	M	207	236	244	390
	9/26	GLP-2	0.62	85	M	198	219	230	320
	9/27	LPM-3	0.25	–[2]	U	36	44	46	1.2
			0.36	–[2]	U	39	48	50	1.7
			0.37	–[2]	U	30	37	39	0.7
Largemouth Bass (*Micropterus salmoides*)	9/25	GLP-1	0.97	82	F	304	340	350	555
			0.91	78	M	339	369	387	860
			0.40	77	F	153	170	179	72
			0.80	80	M	297	330	346	690
			0.87	80	M	281	309	320	430
			1.08	79	F	409	449	463	1,520
	9/26	GLP-2	1.19	79	M	392	433	450	1,505
			0.99	78	M	277	304	319	470
			0.73	80	F	182	201	210	155
			0.73	83	M	205	228	237	200
	9/27	LPM-3	0.42	–[2]	U	55	64	67	3.6
			0.47	–[2]	U	54	62	65	3.5

Species	Sample Date (2018)	Site ID[1]	Total Mercury (µg/g [wet weight])	Moisture (percent)	Sex	Fish Length (mm)			Fish Weight (g)
						SL	FL	TL	
Sacramento Pikeminnow (*Ptychocheilus grandis*)	9/24	GLP-3	1.48	76	F	321	354	384	395
			1.29	78	F	395	428	460	770
			1.22	79	F	322	358	386	430
			1.33	78	F	335	365	387	430
	9/25	GLP-1	1.58	79	F	395	424	452	680
			2.08	80	F	414	450	481	745
			0.52	72	F	253	275	299	205
			1.90	79	F	382	417	451	665
	9/26	GLP-2	1.55	75	F	377	407	439	660
			1.92	78	F	388	417	452	760
MDL			***0.003***	–	–	–	–	–	–
RL			***0.009***	–	–	–	–	–	–

Source: PG&E 2019a

[1] GLP-3 sample location 39.411691 N, -122.954639 E.; GLP-1 sample location 39.409465 N, -122.920595 E; GLP-2 sample location 39.400101 N, -122.949281 E; and LPM-3 sample location 39.419147 N, -122.942855 E. Datum: World Geodetic System (WGS) 84.

[2] Not analyzed by laboratory.

Notes: µg/g = microgram per gram
F = female
FL = fork length
g = grams
M = male
MDL = method detection limit
mm = millimeter
RL = reporting limit
SL = standard length
TL = total length
U = unknown

3.3.2.4 References

Bouma-Gregson K., R.M. Kudela, and M.E. Power. 2018. Widespread anatoxin-a detection in benthic cyanobacterial mats throughout a river network. PLOS ONE 13(5):e0197669. Available at: Widespread anatoxin-a detection in benthic cyanobacterial mats throughout a river network | PLOS ONE.

Brown, W.M., III and J.R. Ritter. 1971. Sediment transport and turbidity in the Eel River basin, California. U.S. Geological Survey Water Supply Paper 1986, 70 pp.

CEDEN (California Environmental Data Exchange Network). 2024. Data system for surface water quality in California. Available at: CEDEN Query Tool (ca.gov). Accessed June 20, 2024.

CEDEN (California Environmental Data Exchange Network). 2016. Data system for surface water quality in California. Available at: CEDEN Query Tool (ca.gov).

CWQMC (California Water Quality Monitoring Council). n.d. Freshwater harmful algal bloom (HAB) incidents. California Harmful Algal Blooms Portal. Retrieved November 21, 2024, from https://mywaterquality.ca.gov/habs/where/freshwater_events.html.

Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2009. Contaminants in fish from California lakes and reservoirs: technical report on year one of a two-year screening survey. A report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.

EarthInfo. 1994. USGS Daily Values West1 1994. CD-ROM under product license agreement. EarthInfo Inc. Boulder, CO.

Ellison, J.P. 1982. Lake Pillsbury hypolimnion aeration system: Initial feasibility study. California Department of Fish and Game, Inland Fisheries, Region 3.

Friedrichsen, G. 1998. Eel River water quality monitoring project. Final report. Submitted to State Water Quality Control Board, for 205(J) Contract #5-029-250-2. Humboldt County Resources Conservation District. Eureka, CA.

Garcia and Associates (GANDA). 2016. Qualitative water testing results for Anatoxin-A at selected sites in Potter Valley. October 26.

Kubicek, P.F. 1977. Summer water temperature conditions in the Eel River system, with reference to trout and salmon. MS Thesis, Humboldt State University, Arcata, CA.

NCRWQCB (North Coast Regional Water Quality Control Board). 2018. Water quality control plan for the North Coast region. May. Available at: Basin Plan Documents | California North Coast Regional Water Quality Control Board.

NMFS (National Marine Fisheries Service). 2002. Biological opinion for the proposed license amendment for the Potter Valley Project (Federal Energy Regulatory Commission Project Number 77-110). NMFS Southwest Region. November 26.

PG&E (Pacific Gas and Electric Company). 2024. Draft summer water temperature monitoring results, 2023. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2023. Article 52(a): report section 3. Summer water temperature monitoring results, 2022. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2022. Article 52(a): report section 3. Summer water temperature monitoring results, 2021. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2021. Article 52(a): report section 3. Summer water temperature monitoring results, 2020. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2020. Article 52(a): report section 3. Summer water temperature monitoring results, 2019. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2019a. AQ-3 water quality study data memorialization. Technical study summary. Potter Valley Project (FERC Project No. 77) relicensing December 6, 2019.

PG&E (Pacific Gas and Electric Company). 2019b. Article 52(a): report section 3. Summer water temperature monitoring results, 2016. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2018a. AQ 3 – water quality technical study plan, Potter Valley Project, revised study plan. Filed with FERC on January 15, 2018.

PG&E (Pacific Gas and Electric Company). 2018b. Article 52(a): report section 3. Summer water temperature monitoring results, 2017. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2017. Article 52(a): report section 3. Summer water temperature monitoring results, 2016. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2016. Article 52(a): report section 3. Summer water temperature monitoring results, 2015. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2015. Article 52(a): report section 3. Summer water temperature monitoring results, 2014. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2014. Article 52(a): report section 3. Summer water temperature monitoring results, 2013. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2013. Article 52(a): report section 3. Summer water temperature monitoring results, 2012. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2012. Article 52(a): report section 3. Summer water temperature monitoring results, 2011. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2011. Article 52(a): report section 3. Summer water temperature monitoring results, 2010. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2010. Article 52(a): report section 3. Summer water temperature monitoring results, 2009. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2009. Article 52(a): report section 3. Summer water temperature monitoring results, 2008. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2008. Article 52(a): report section 3. Summer water temperature monitoring results, 2007. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2007. Article 52(a): report section 3. Summer water temperature monitoring results, 2006. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2006. Article 52(a): report section 3. Summer water temperature monitoring results, 2005. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2005. Summer water temperature monitoring plan. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. August.

Puckett, L.K., and W.F. Van Woert. 1972. Water temperature observations in the Eel River system 1957–1969, a data report. California Department of Fish and Game. Mimeograph.

Otten, T. 2024. Cyanobacterial testing results (Agreement# 22-023-270). Ben Genetics, LLC.

Otten, T. 2023. Cyanobacterial testing results (Agreement# 22-023-270). Ben Genetics, LLC.

Steiner Environmental Consulting (SEC). 1987–1996, 1998. Potter Valley Project (FERC No. 77, Article 39). Effects of Operations on Upper Eel River Anadromous Salmonids. Final Report(s). 1987-1996, March 1998. Prepared for PG&E, Technical and Ecological Services, San Ramon, CA.

SWRCB (State Water Resourses Control Board). 2024. Available at: waterboards.ca.gov/water_issues/programs/tmdl/2023_2024state_ir_reports/apx-b-factsheets/00585.shtml#73345.

SWRCB (State Water Resourses Control Board). 2017. Final Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions. Available at: waterboards.ca.gov/water_issues/programs/mercury/docs/hg_prov_final.pdf

USEPA (U.S. Environmental Protection Agency). 2007. Lower Eel River Total Maximum Daily Loads for Temperature and Sediment. USEPA Region IX, San Francisco, California.

USEPA (U.S. Environmental Protection Agency). 2005. Final Middle Main Eel River and tributaries (from Dos Rios to the South Fork) Total Maximum Daily Loads for Temperature and Sediment. USEPA Region IX, San Francisco, California.

USEPA (U.S. Environmental Protection Agency). 2004. Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury) total maximum daily loads for Sediment and Temperature. Prepared by USEPA, Region IX, San Francisco, California.

USEPA (U.S. Environmental Protection Agency). 2000a. Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Rule. Federal Register Vol. 65, No. 97. May 18.

USEPA (U.S. Environmental Protection Agency). 2000b. Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria Rivers and Streams in Nutrient Ecoregion II. December.

USEPA (U.S. Environmental Protection Agency). 1999. Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance - Revision of Polychlorinated Biphenyls (PCBs) Criteria. Federal Register 64 (216): 61182-61196.

USEPA (U.S. Environmental Protection Agency). 1978. U.S. Environmental Protection Agency National Eutrophication Survey Working Paper Series Report on Lake Pillsbury Lake County California. EPA Region IX Working Paper No. 755. Corvallis Environmental Research Laboratory – Corvallis, OR, and Environmental Monitoring and Support Laboratory, Las Vegas, Nevada.

USGS (U.S. Geological Survey). 2024. National Water Information System. U.S. Department of the Interior. Retrieved January 7, 2025, from https://waterdata.usgs.gov/nwis.

VTN Oregon Inc. 1982. Potter Valley Project (FERC No.77) Fisheries Study. Final Report Vols. I & II. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

This Page Intentionally Left Blank

Appendix 3.3.2-A

Daily Maximum, Mean, and Minimum Water Temperatures at Selected Eel River Sites (May through October 2005–2023)

This Page Intentionally Left Blank

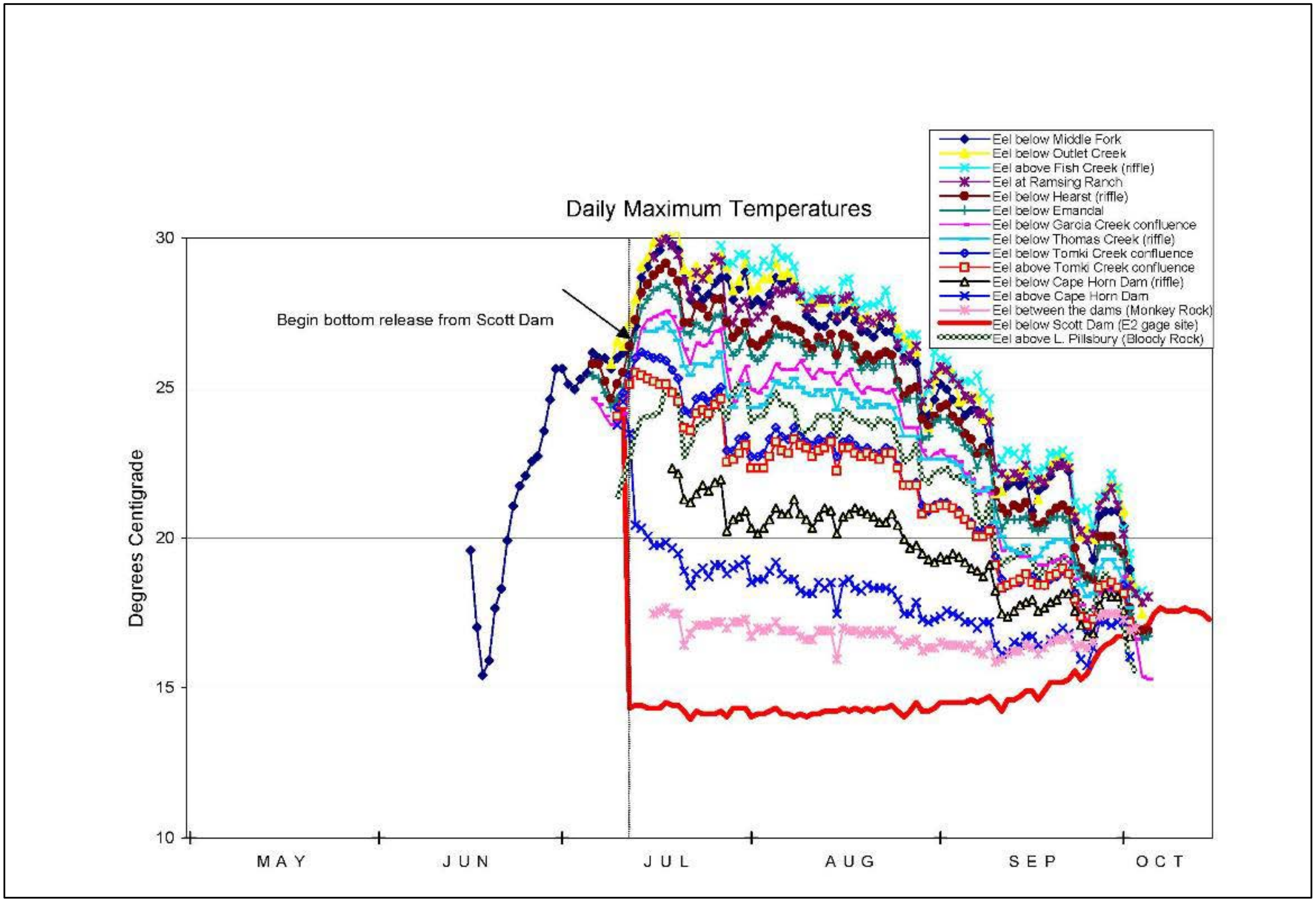


Figure 1. Maximum Daily Water Temperatures at Selected Eel River Sites in 2005

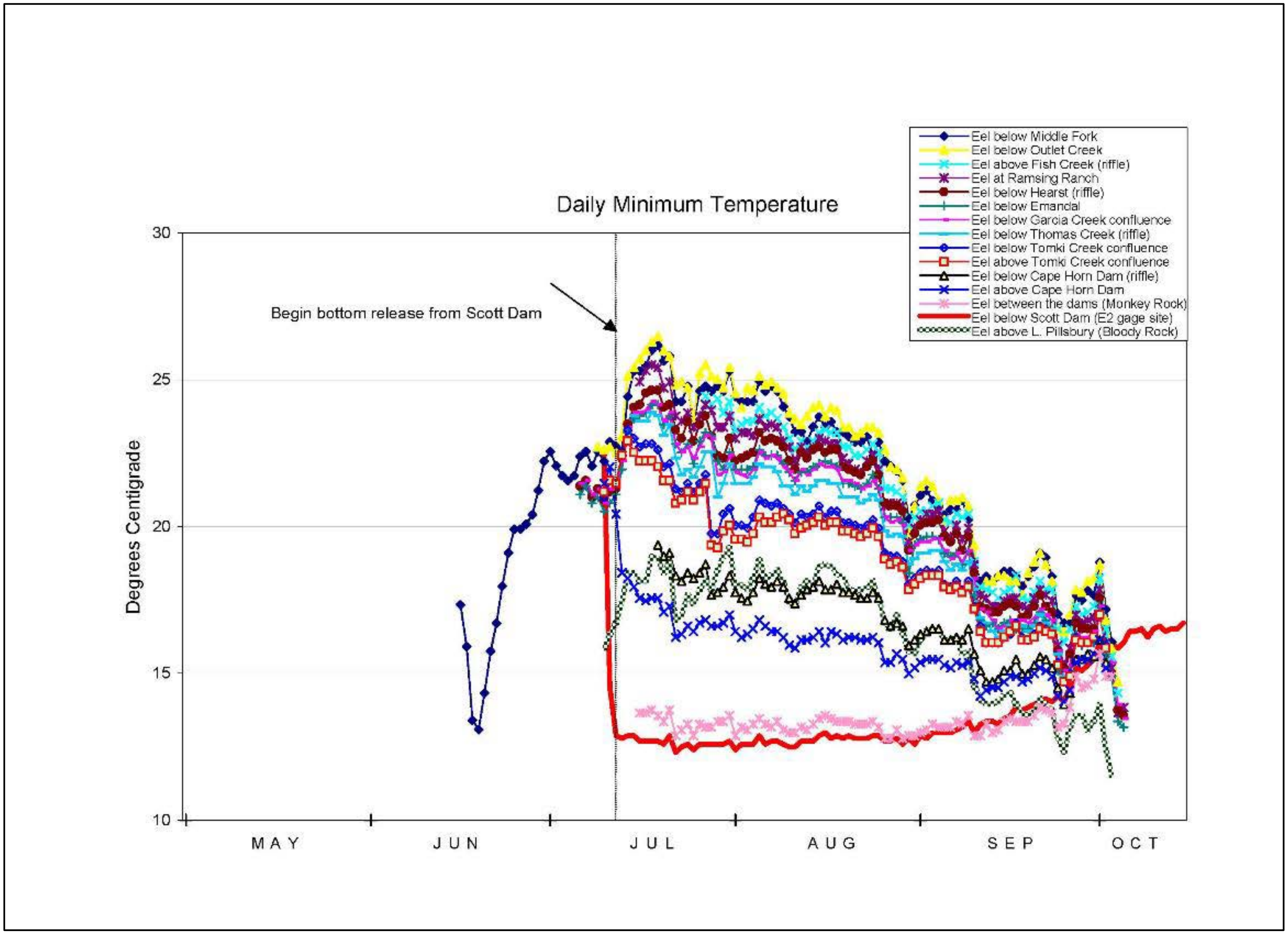


Figure 2. Minimum Daily Water Temperatures at Selected Eel River Sites in 2005

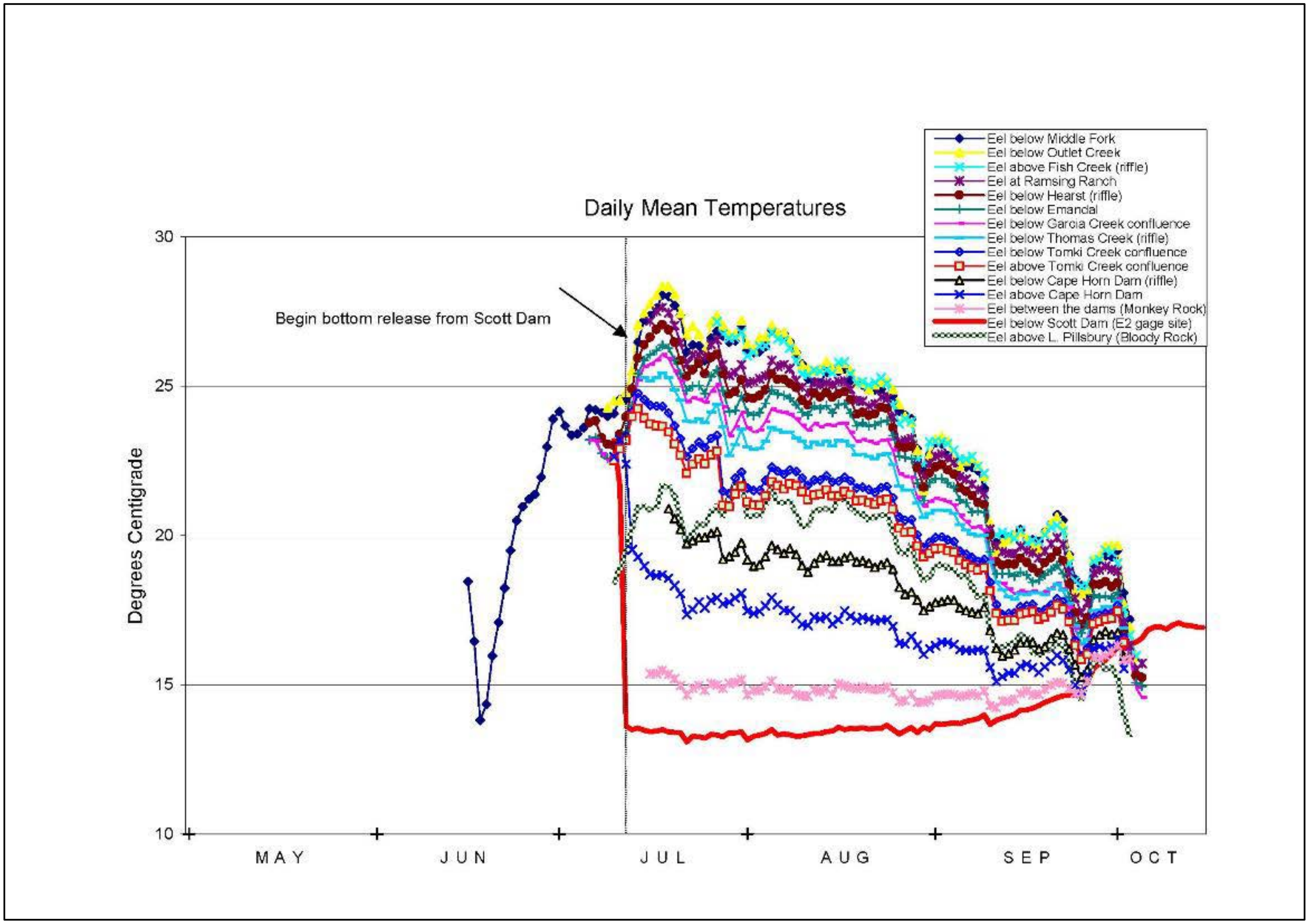


Figure 3. Mean Daily Water Temperatures at Selected Eel River Sites in 2005

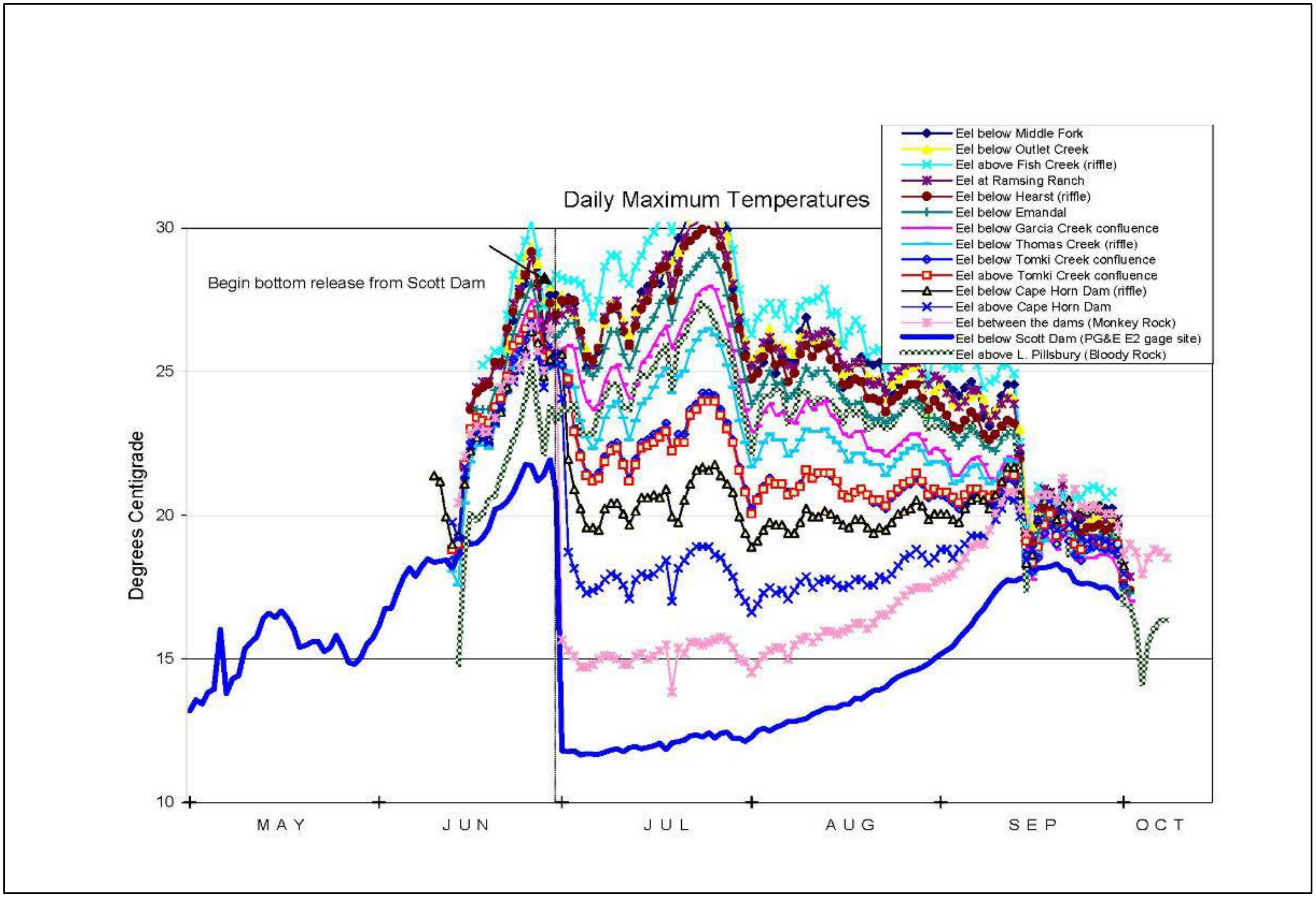


Figure 4. Maximum Daily Water Temperatures at Selected Eel River Sites in 2006

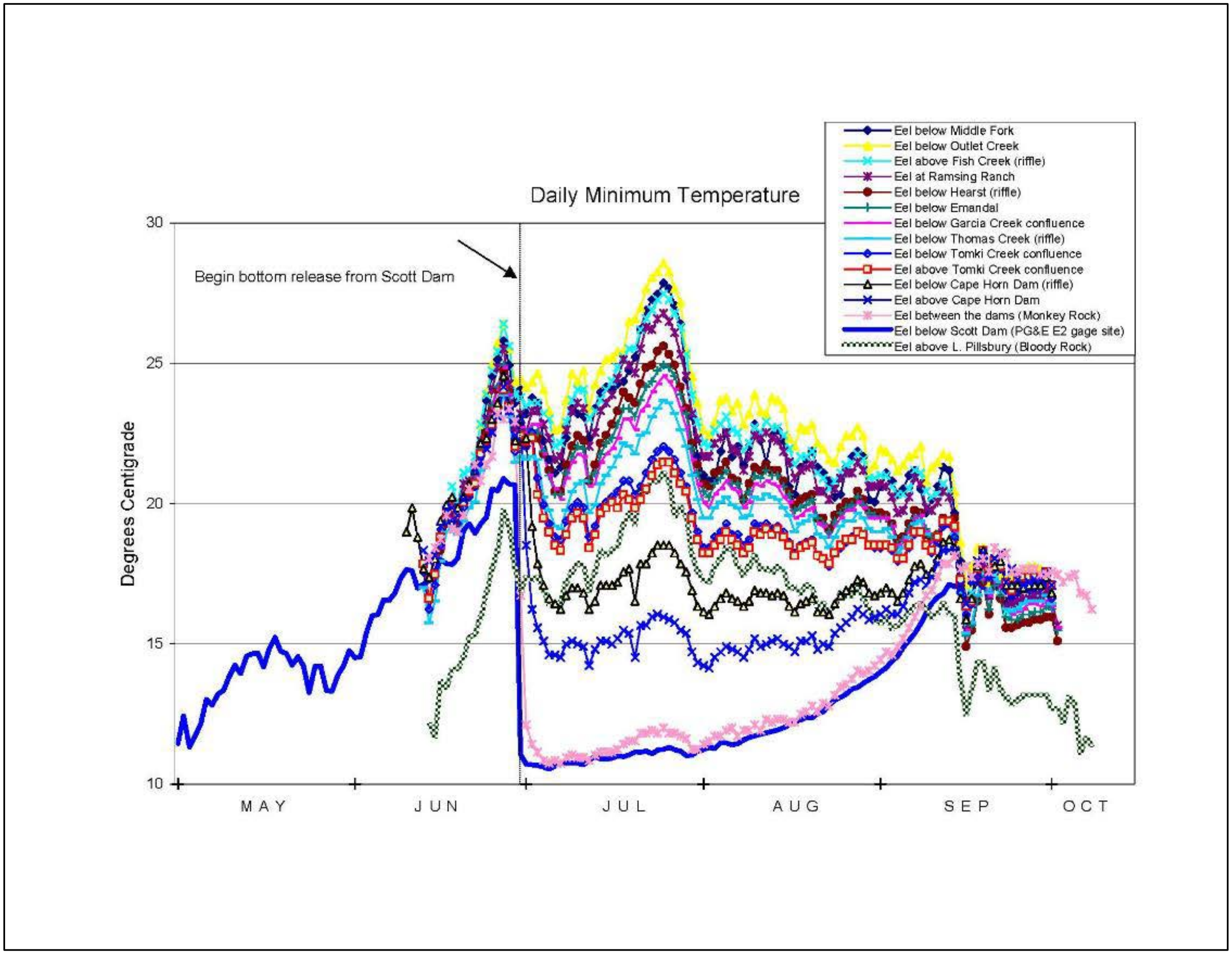


Figure 5. Minimum Daily Water Temperatures at Selected Eel River Sites in 2006

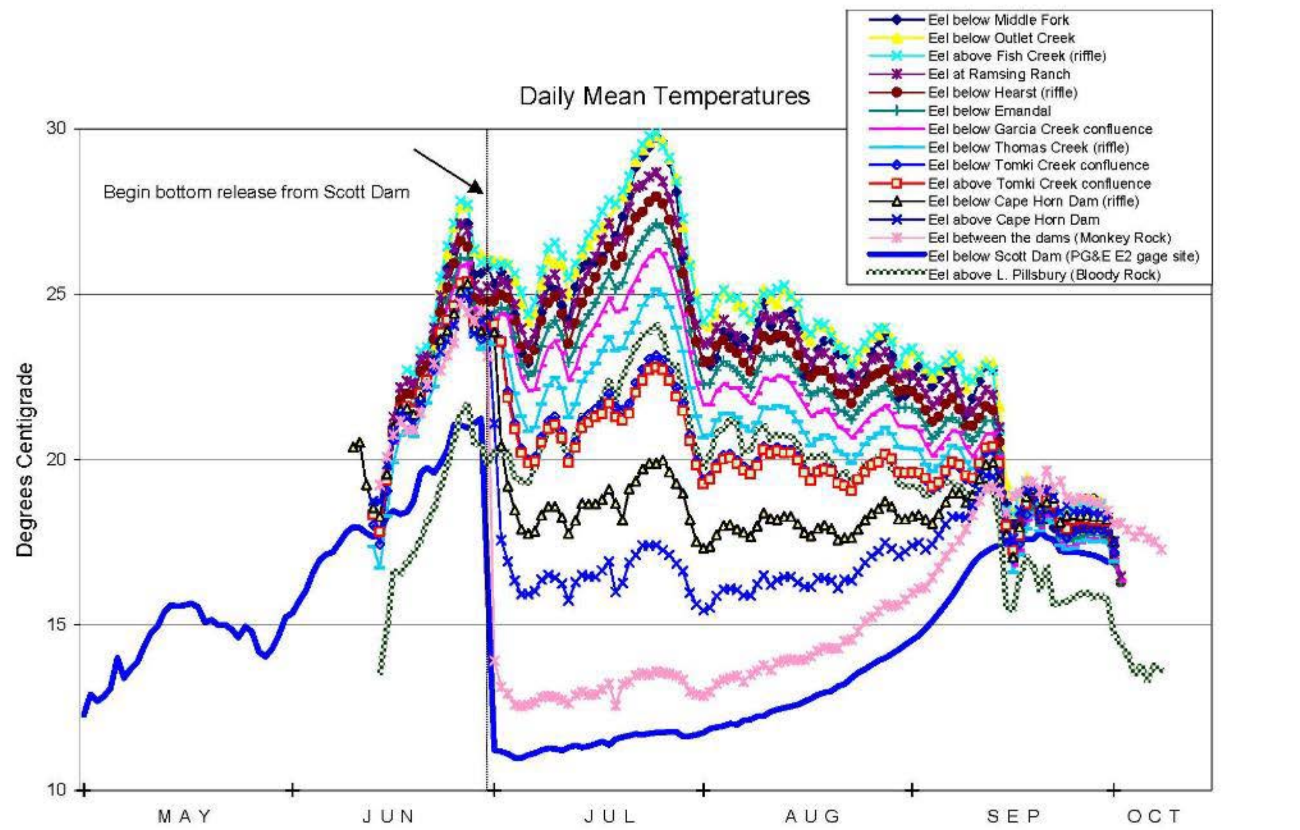


Figure 6. Mean Daily Water Temperatures at Selected Eel River Sites in 2006

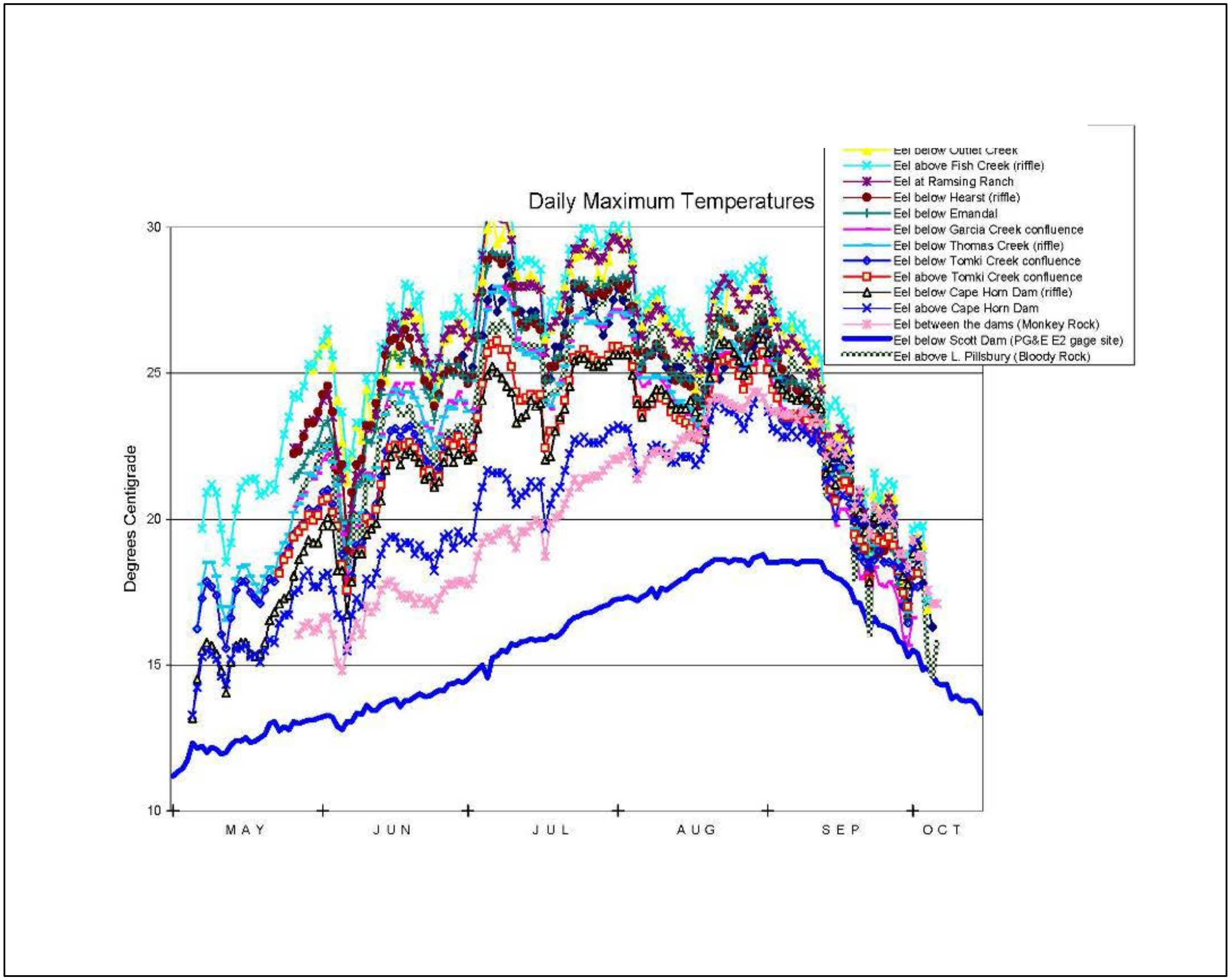


Figure 7. Maximum Daily Water Temperatures at Selected Eel River Sites in 2007

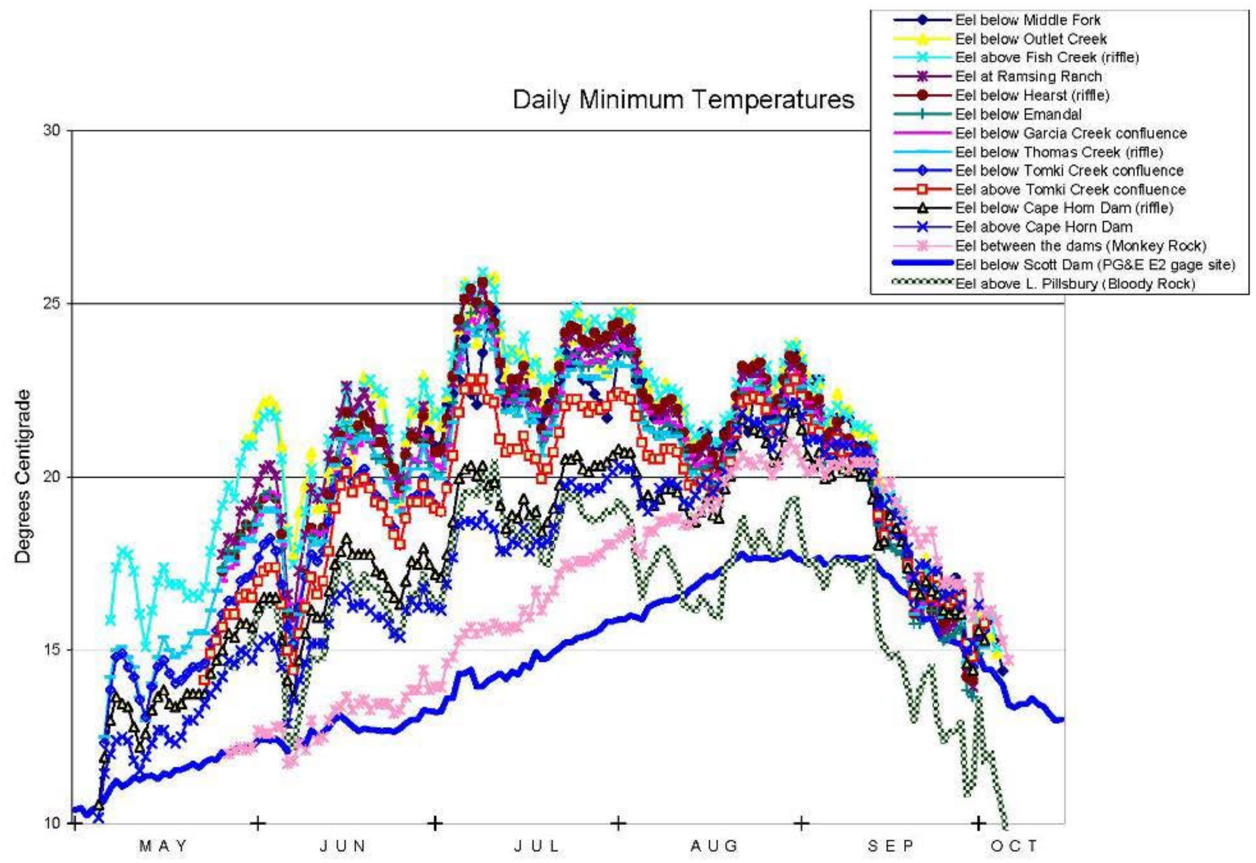


Figure 8. Minimum Daily Water Temperatures at Selected Eel River Sites in 2007

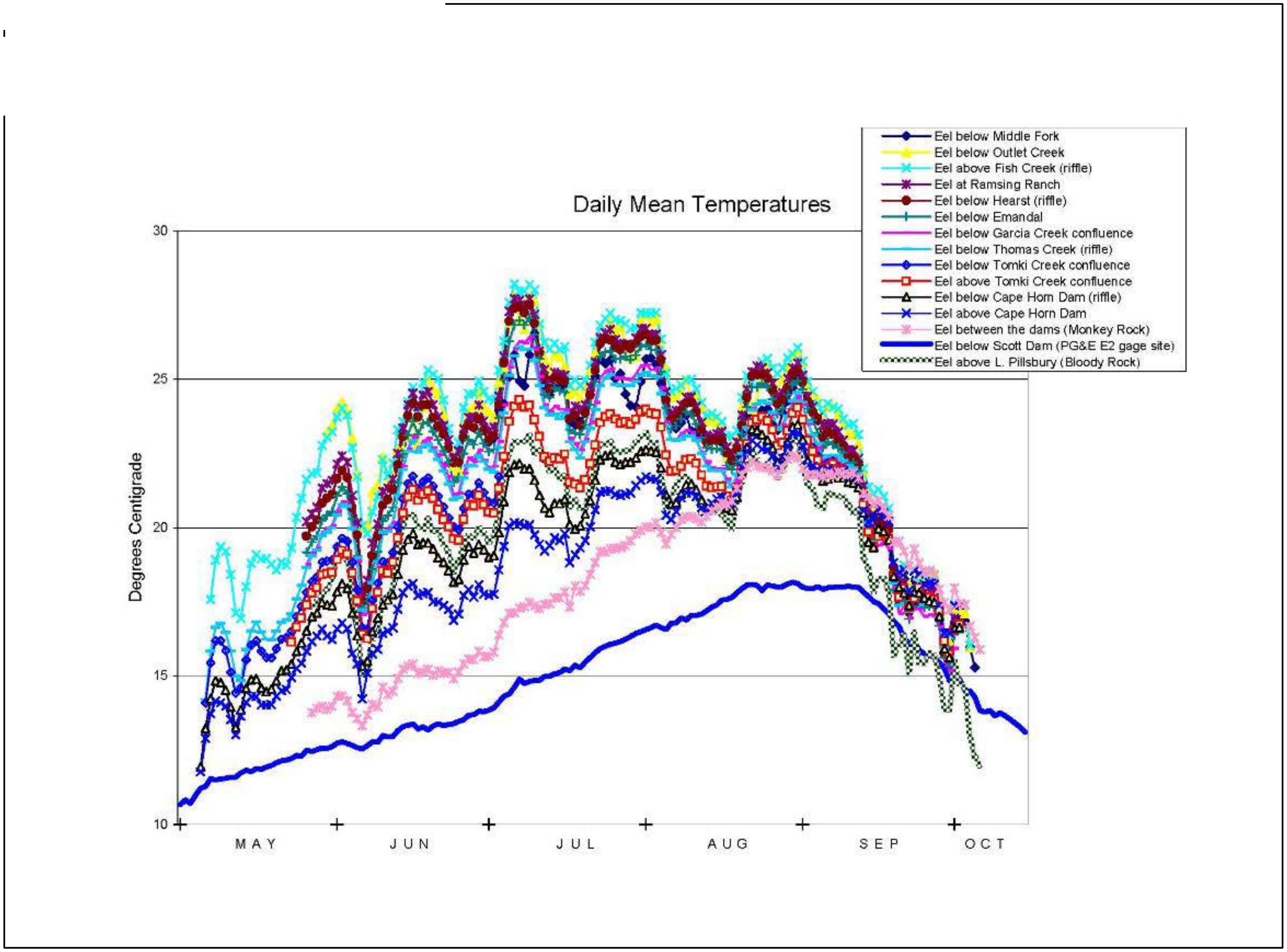


Figure 9. Mean Daily Water Temperatures at Selected Eel River Sites in 2007

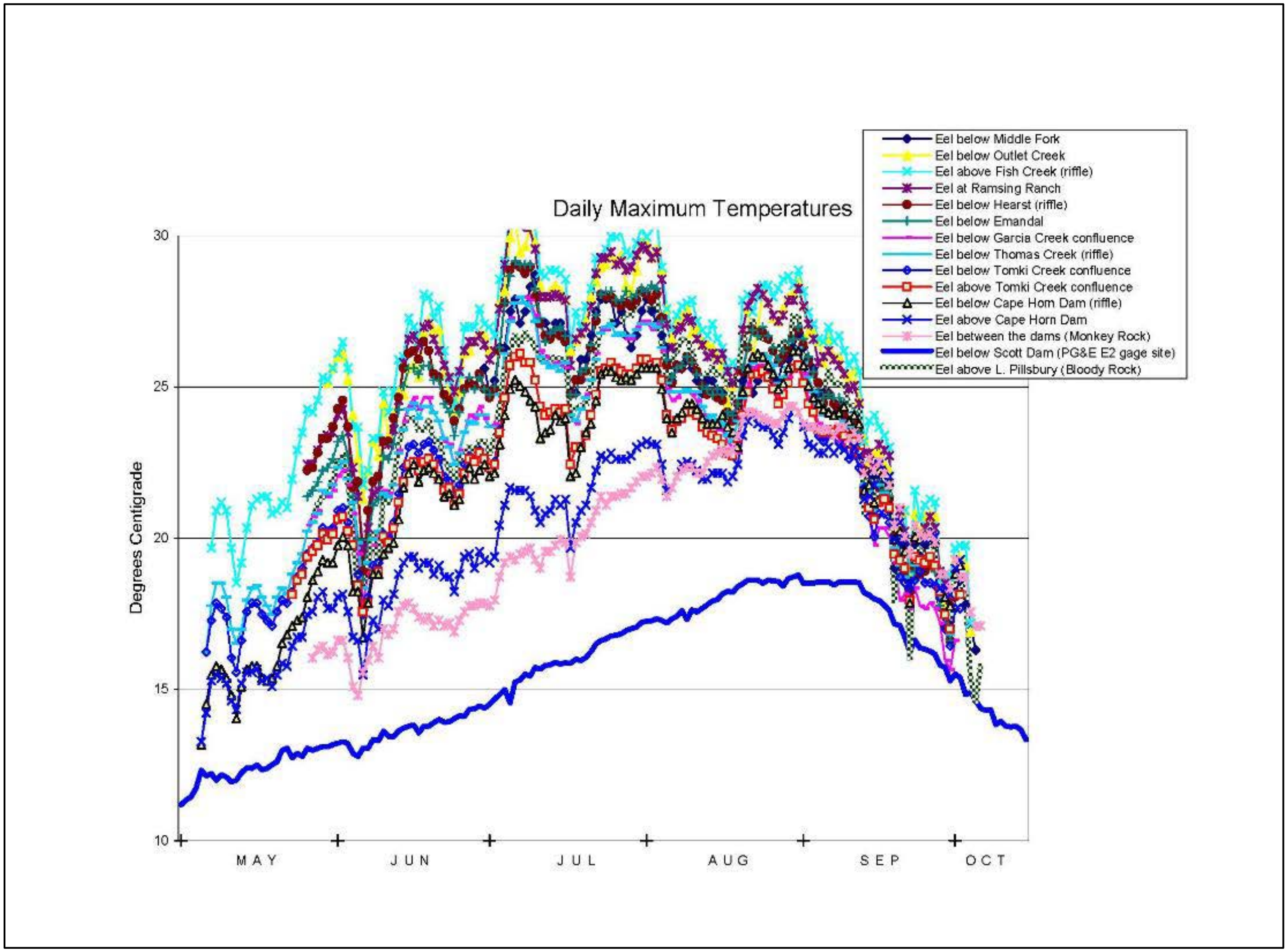


Figure 10. Maximum Daily Water Temperatures at Selected Eel River Sites in 2008

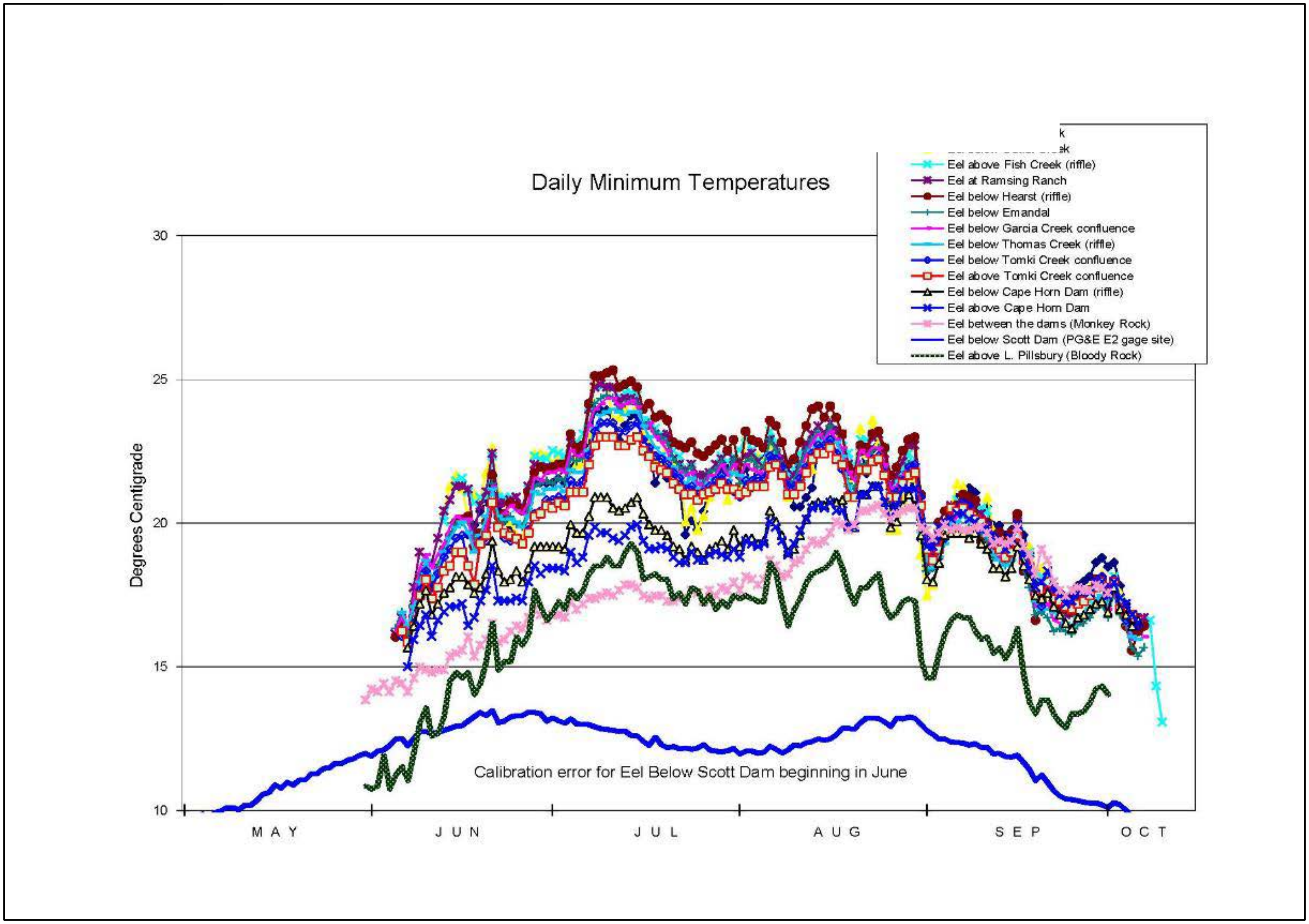


Figure 11. Minimum Daily Water Temperatures at Selected Eel River Sites in 2008.

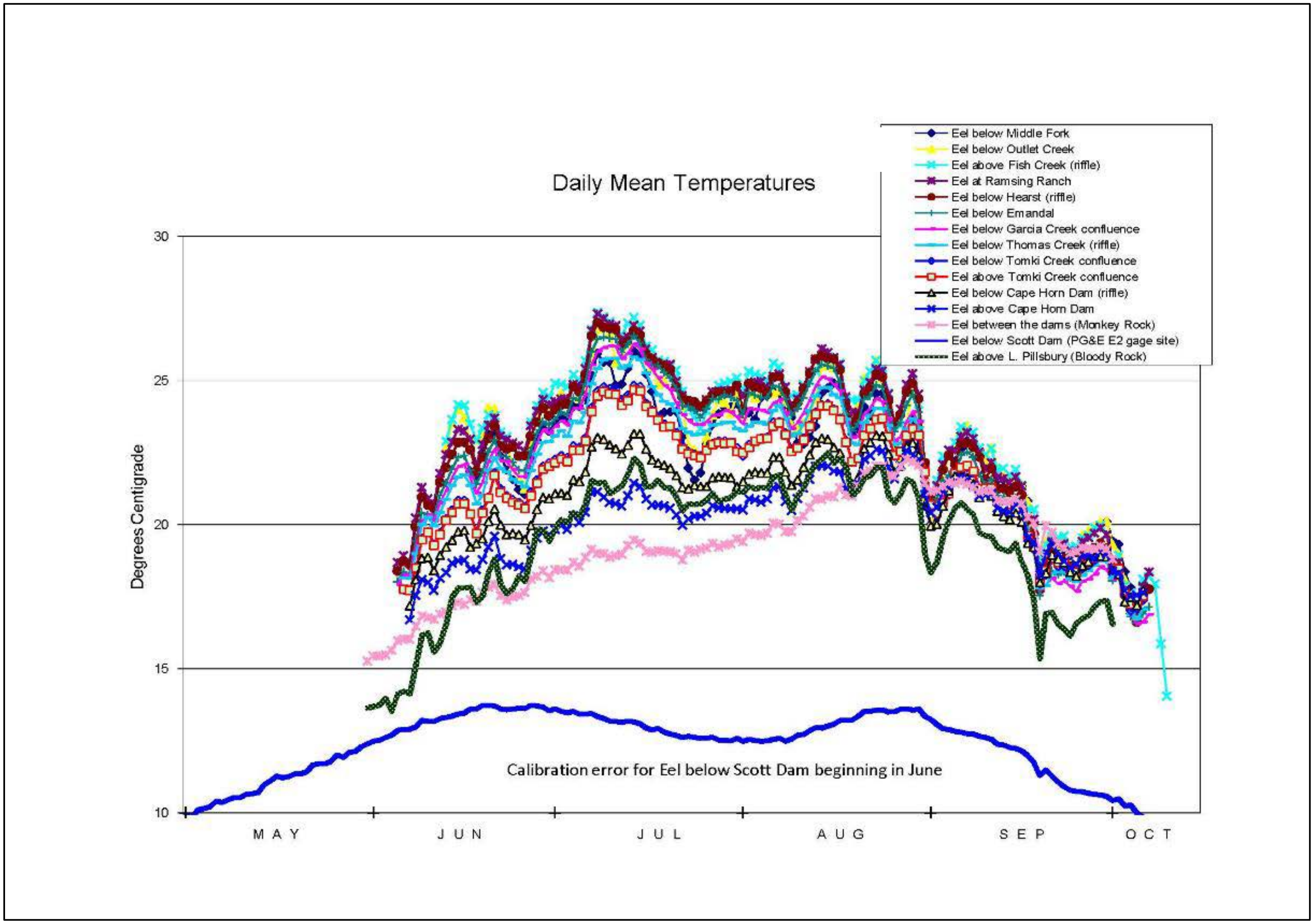


Figure 12. Mean Daily Water Temperatures at Selected Eel River Sites in 2008

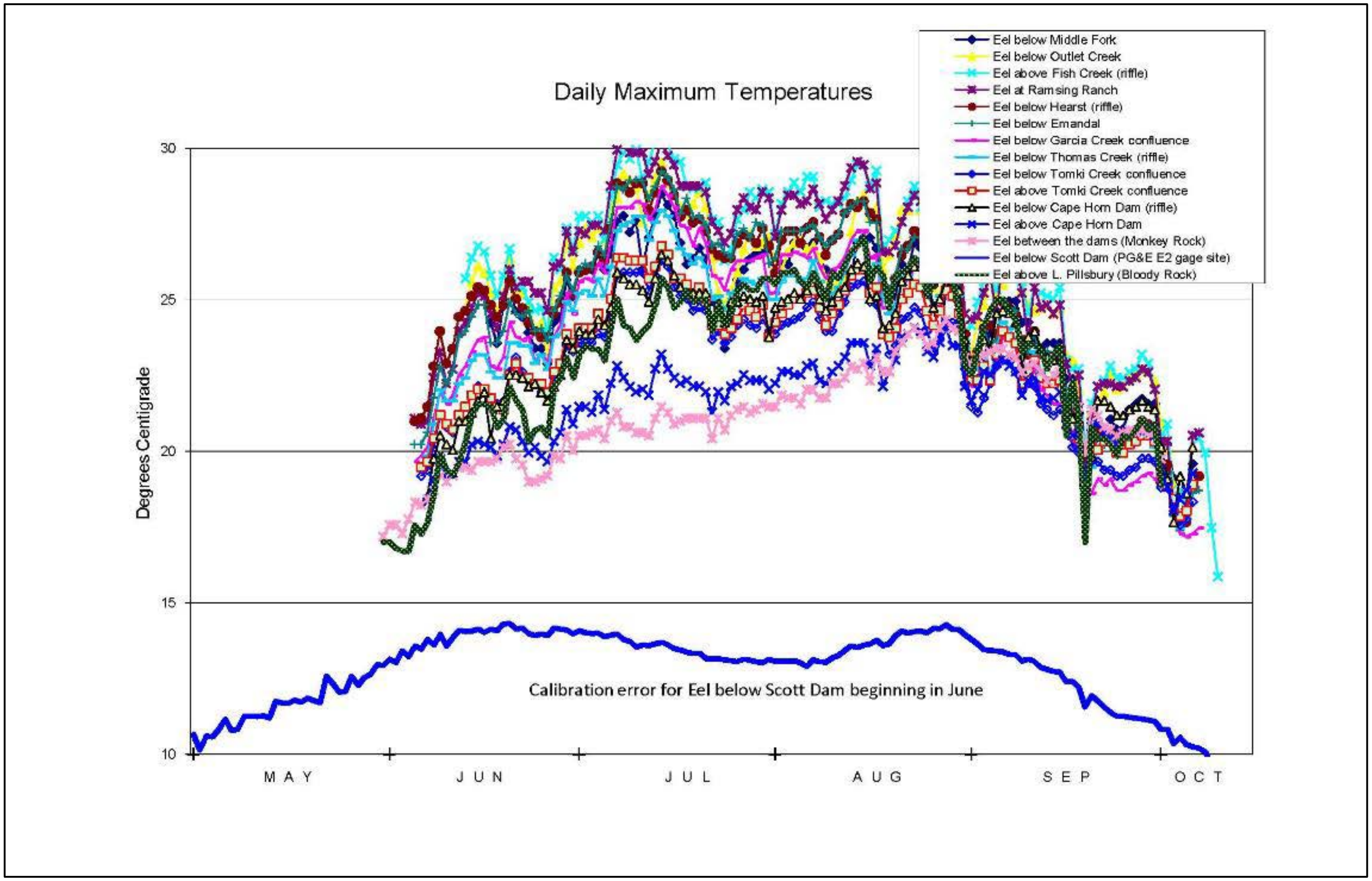


Figure 13. Maximum Daily Water Temperatures at Selected Eel River Sites in 2009

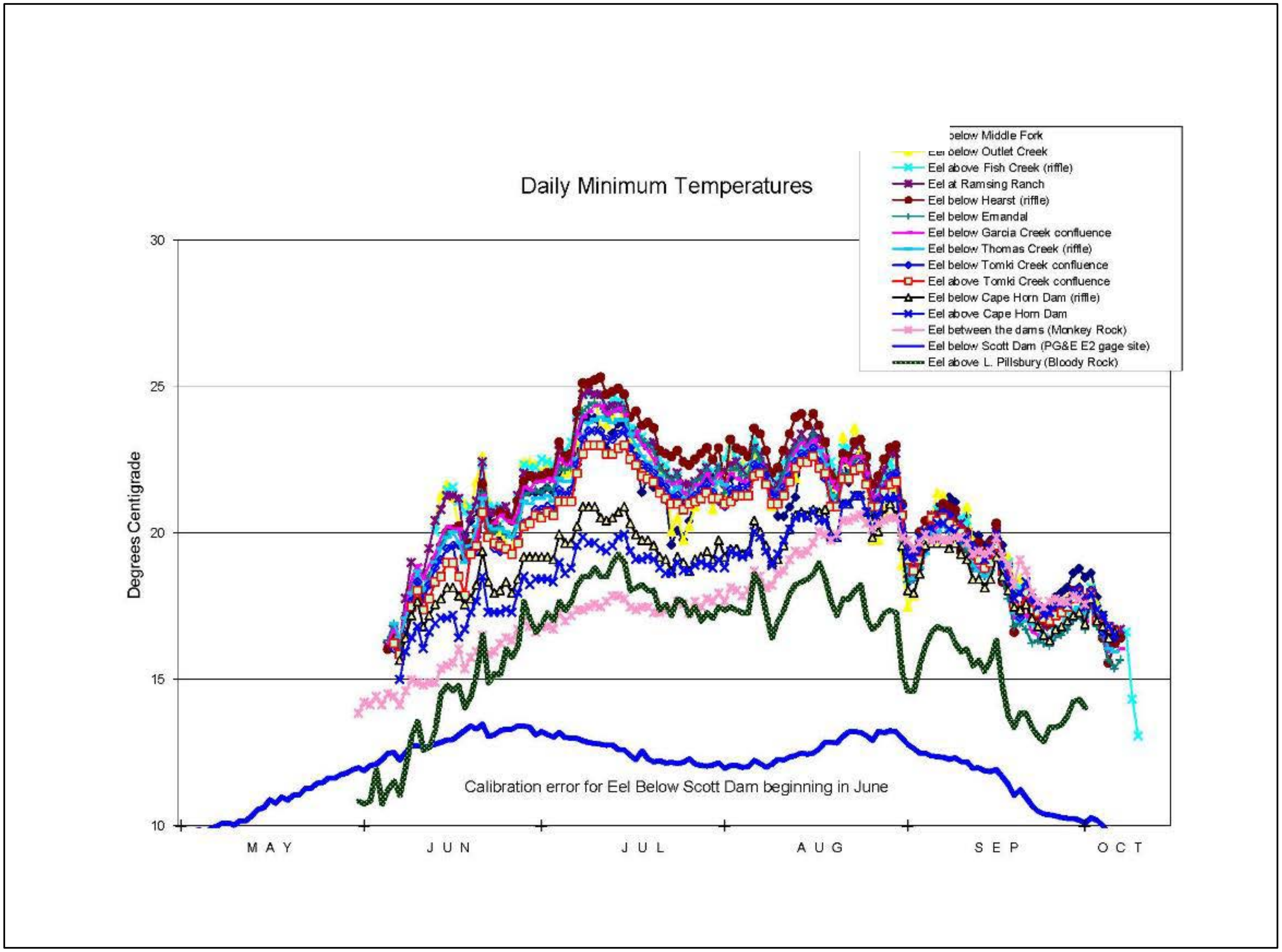


Figure 14. Minimum Daily Water Temperatures at Selected Eel River Sites in 2009

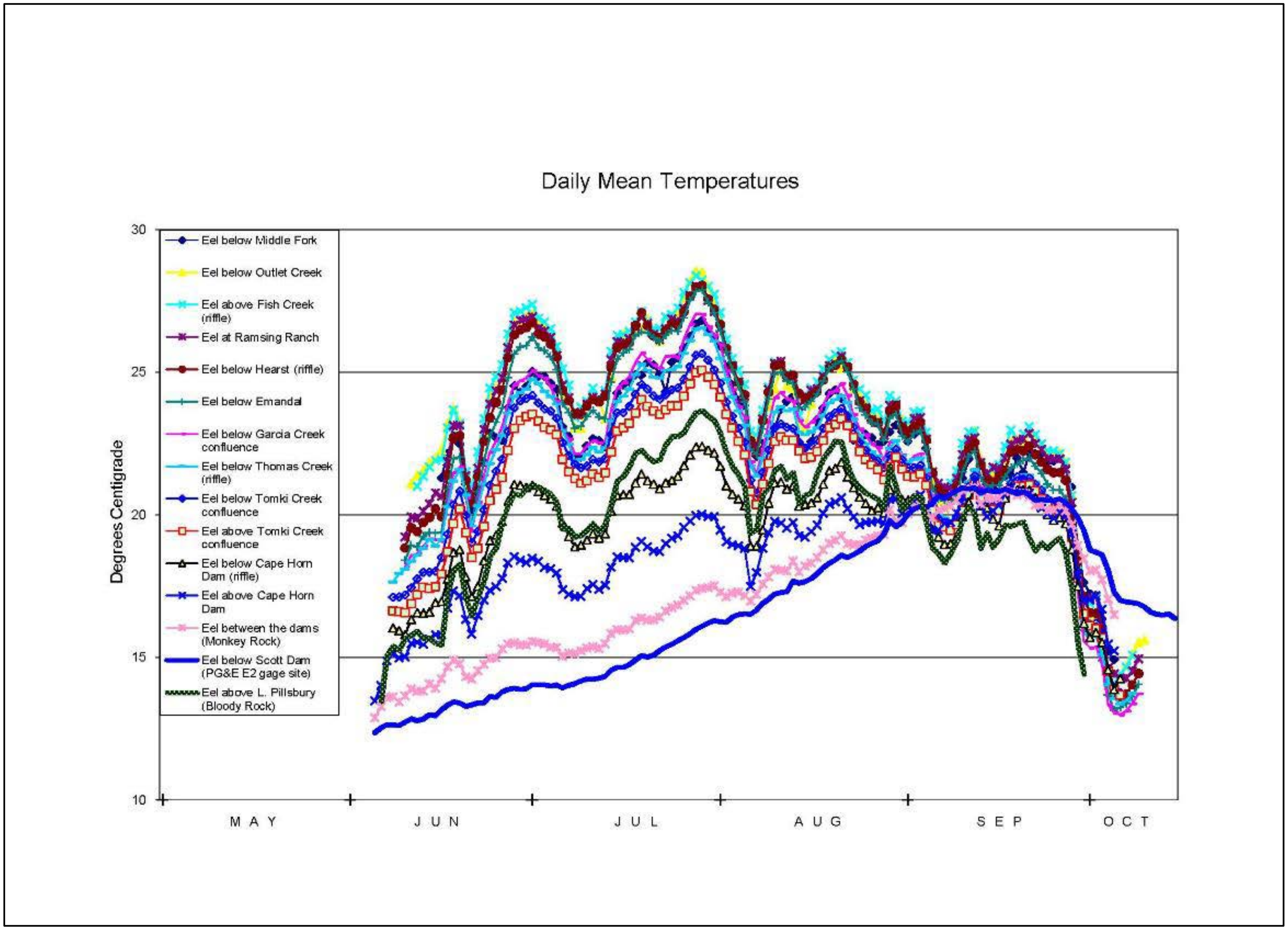


Figure 15. Mean Daily Water Temperatures at Selected Eel River Sites in 2009

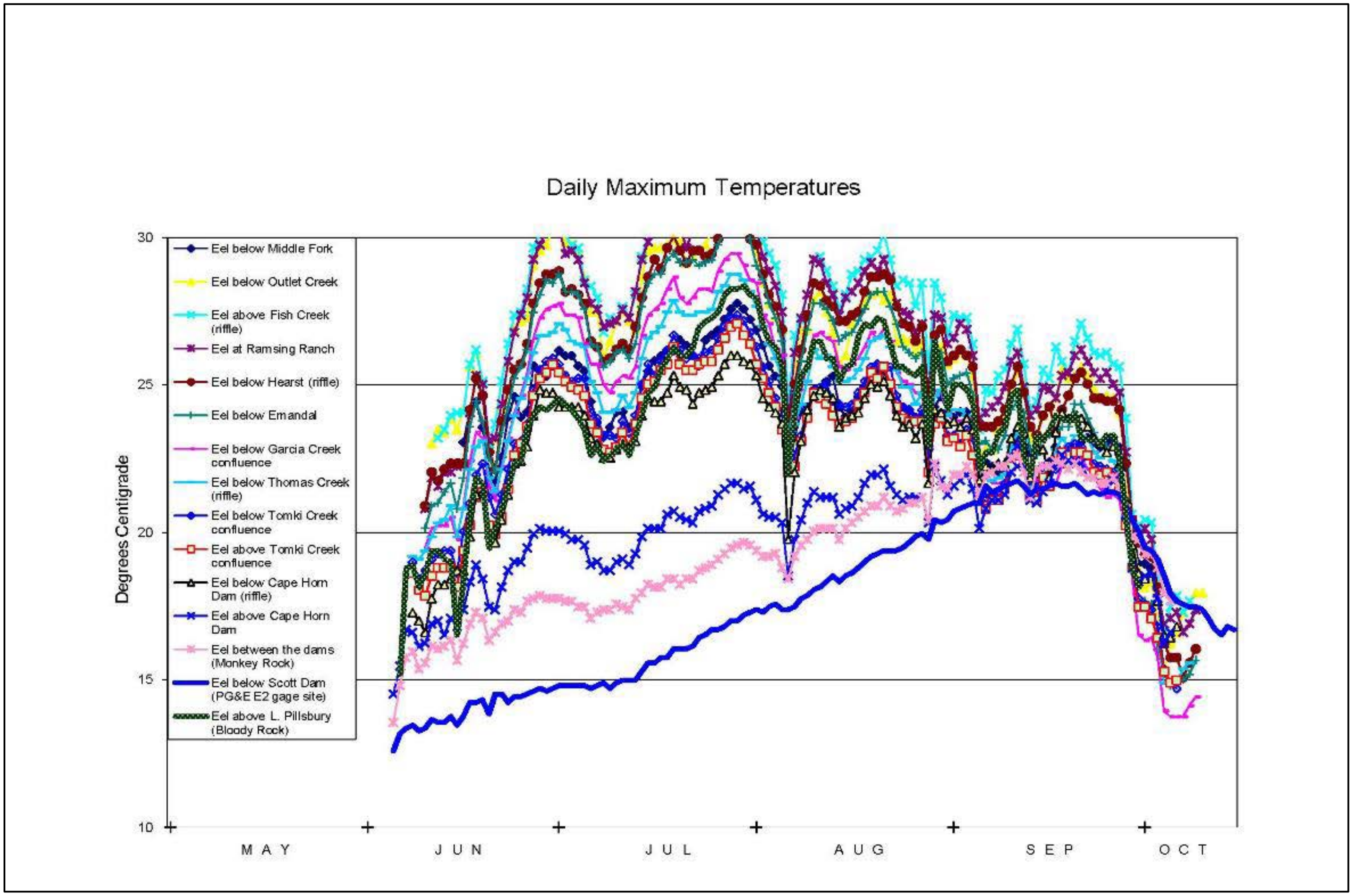


Figure 16 . **Maximum Daily Water Temperatures at Selected Eel River Sites in 2010**

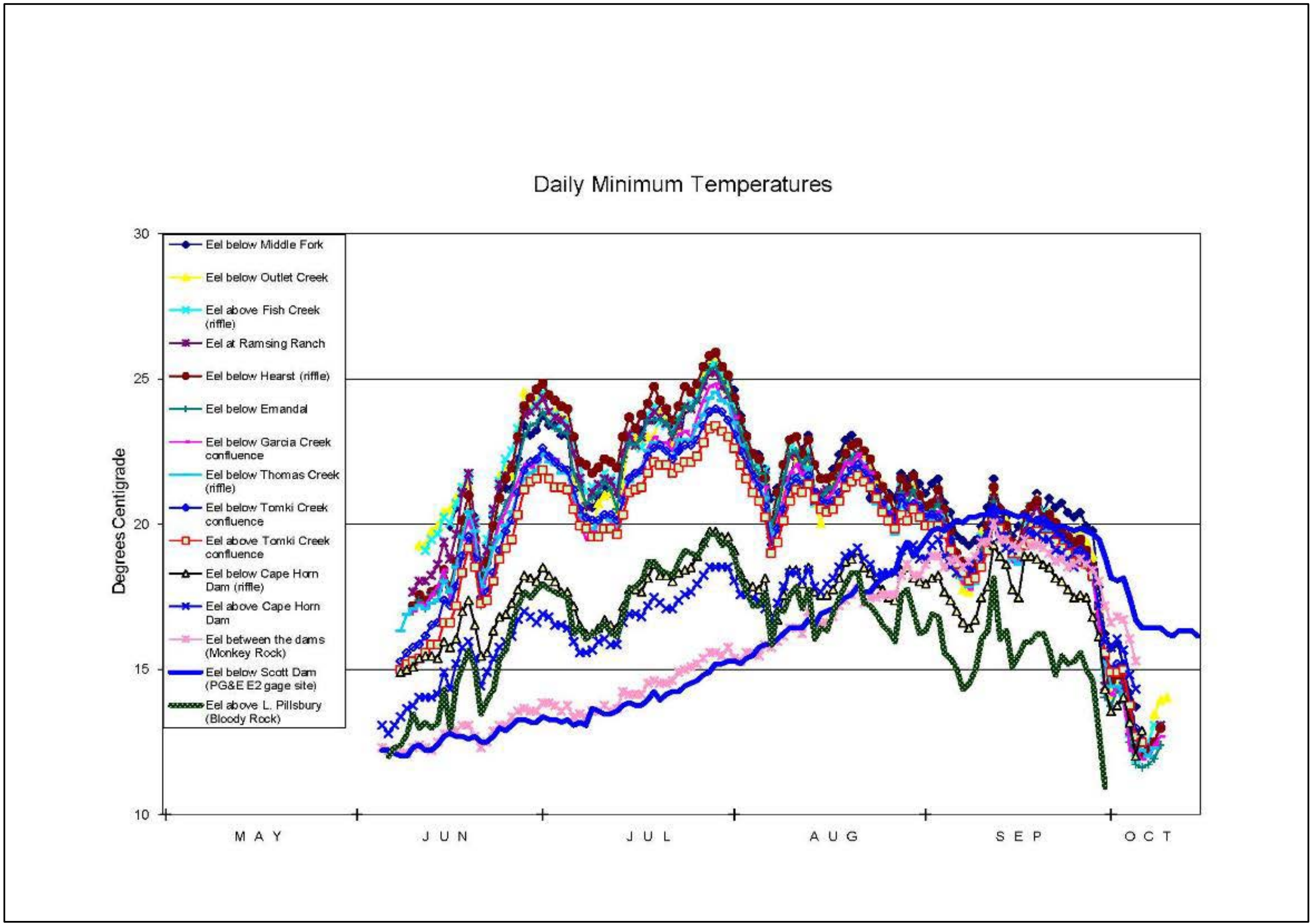


Figure 17. Minimum Daily Water Temperatures at Selected Eel River Sites in 2010

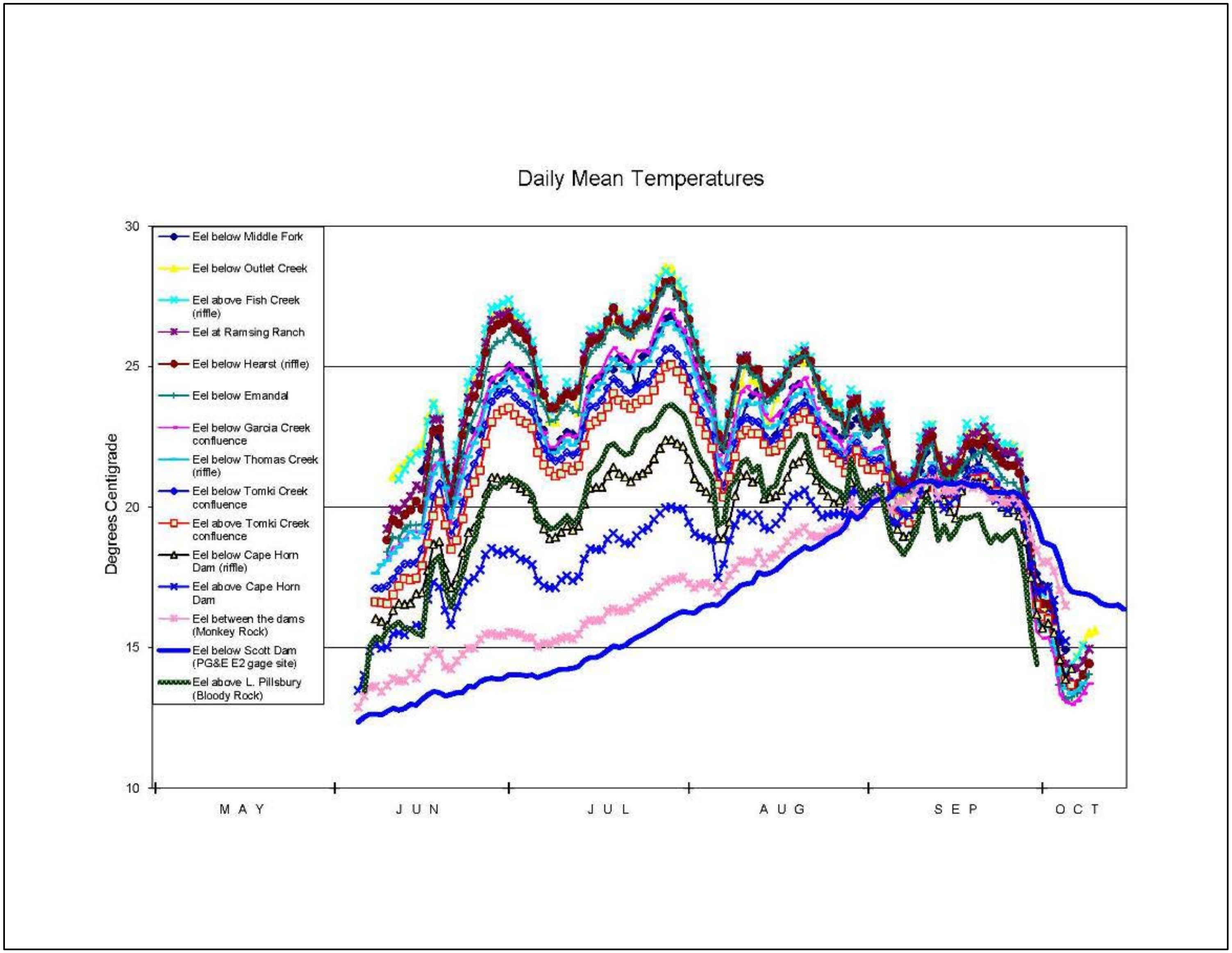


Figure 18 . Mean Daily Water Temperatures at Selected Eel River Sites in 2010

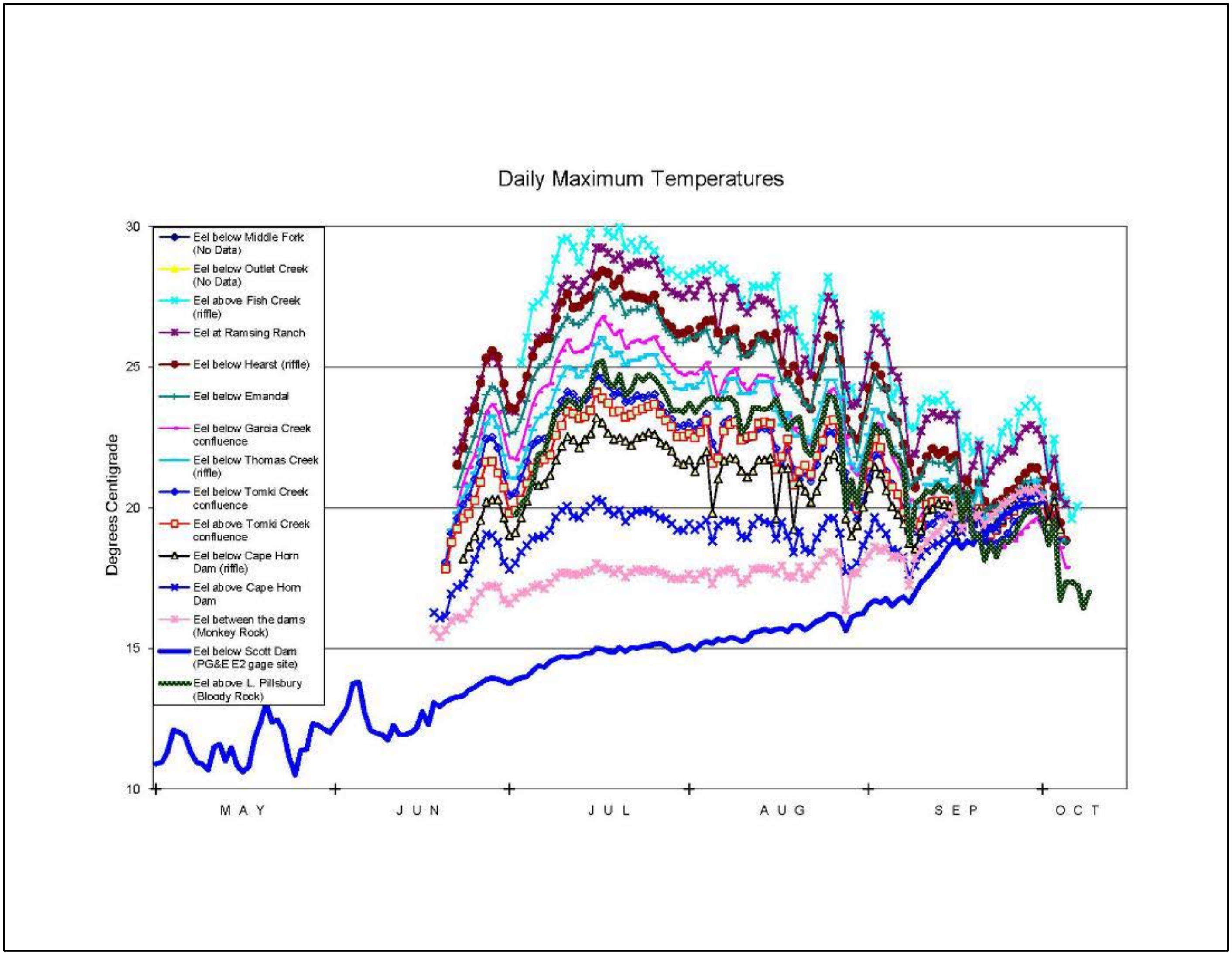


Figure 19. Maximum Daily Water Temperatures at Selected Eel River Sites in 2011

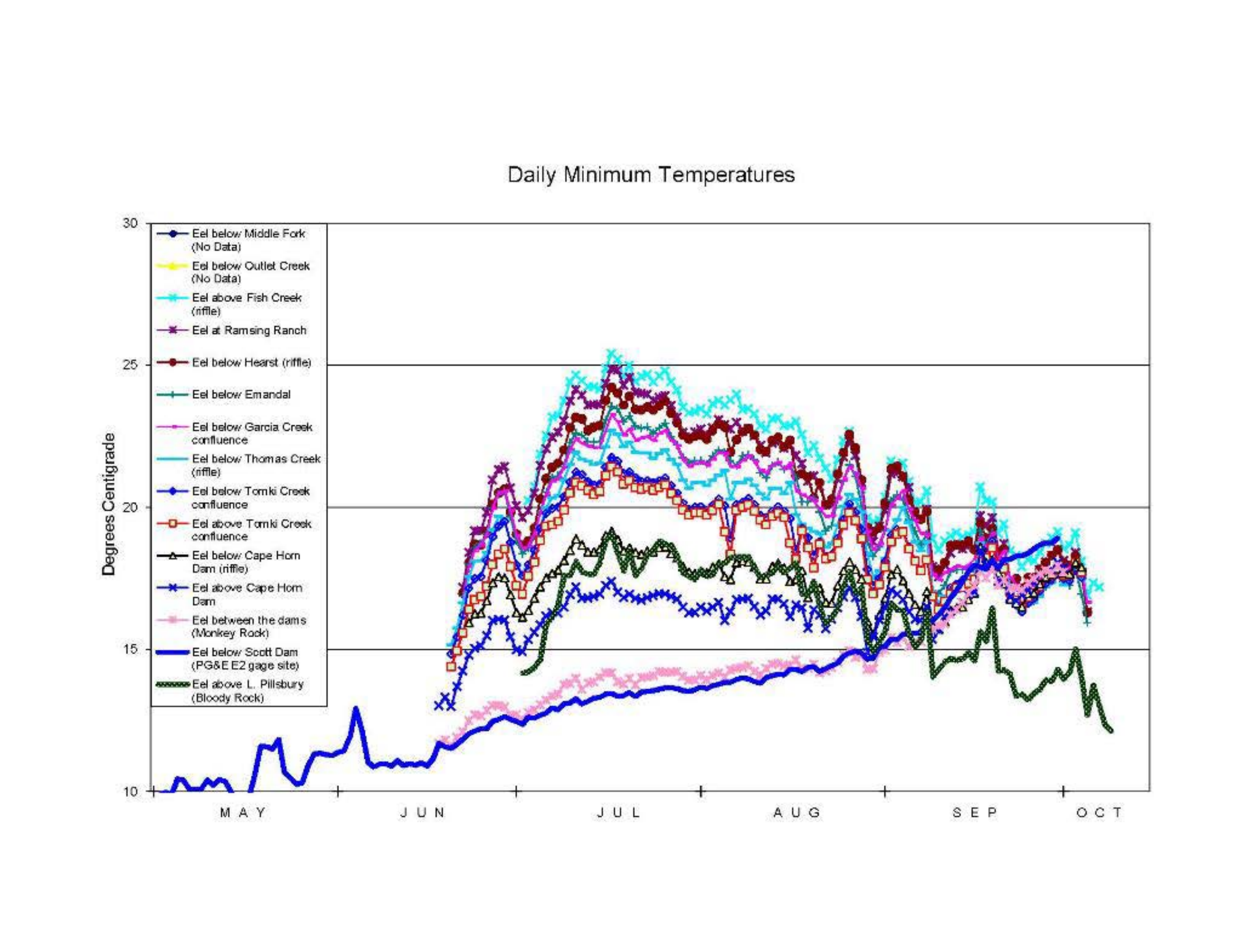


Figure 20. Minimum Daily Water Temperatures at Selected Eel River Sites in 2011

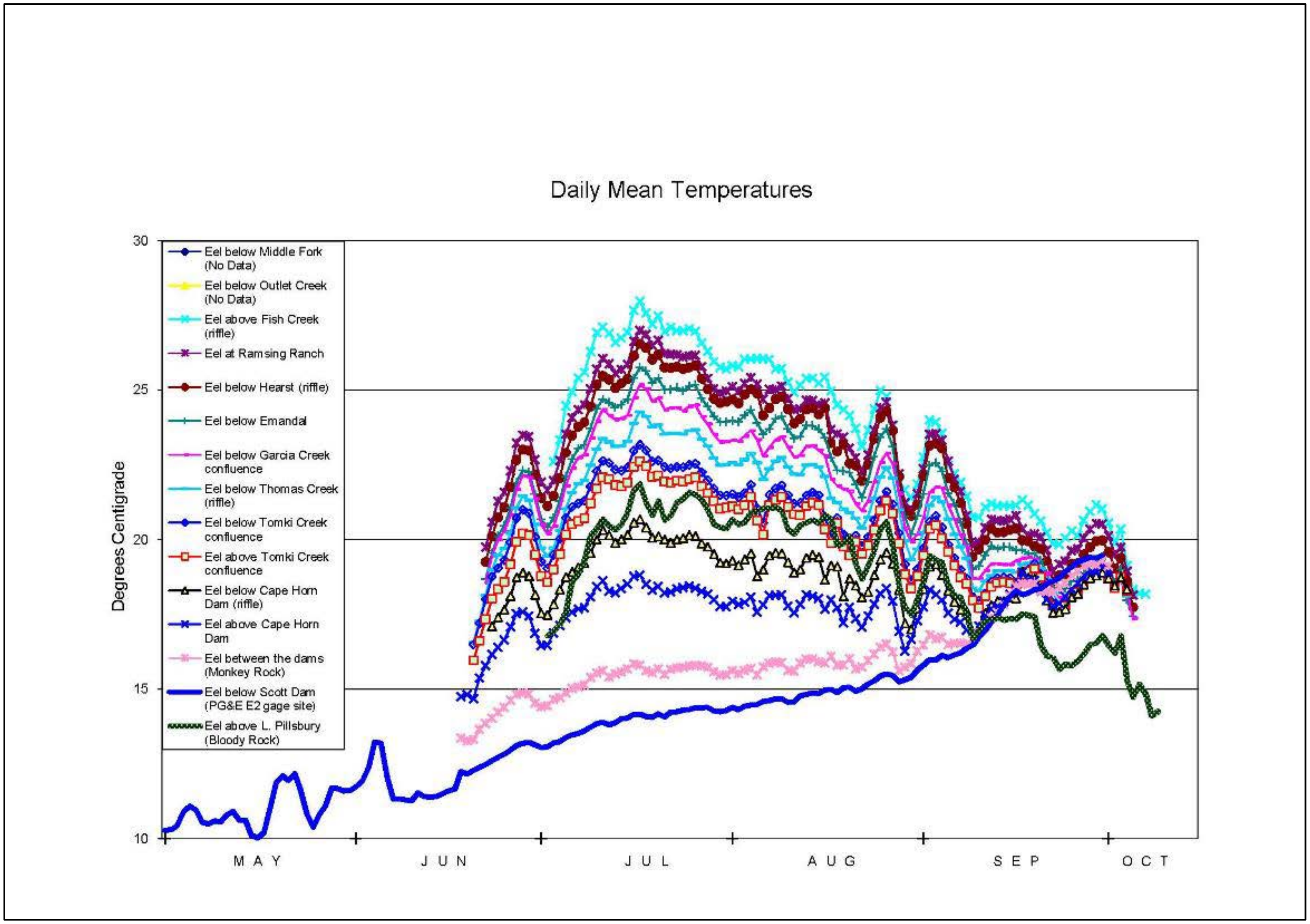


Figure 21. Mean Daily Water Temperatures at Selected Eel River Sites in 2011

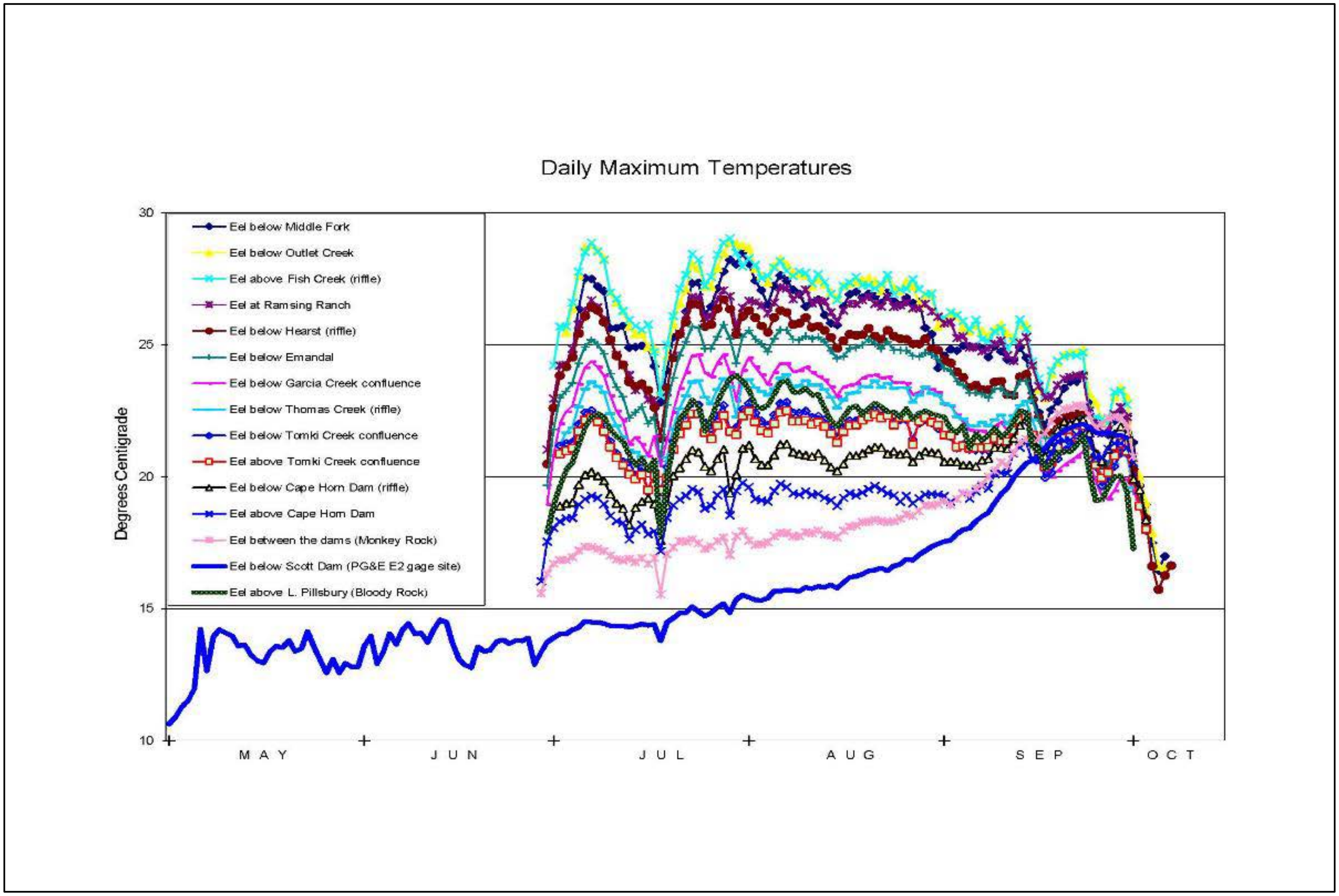


Figure 22. Maximum Daily Water Temperatures at Selected Eel River Sites in 2012

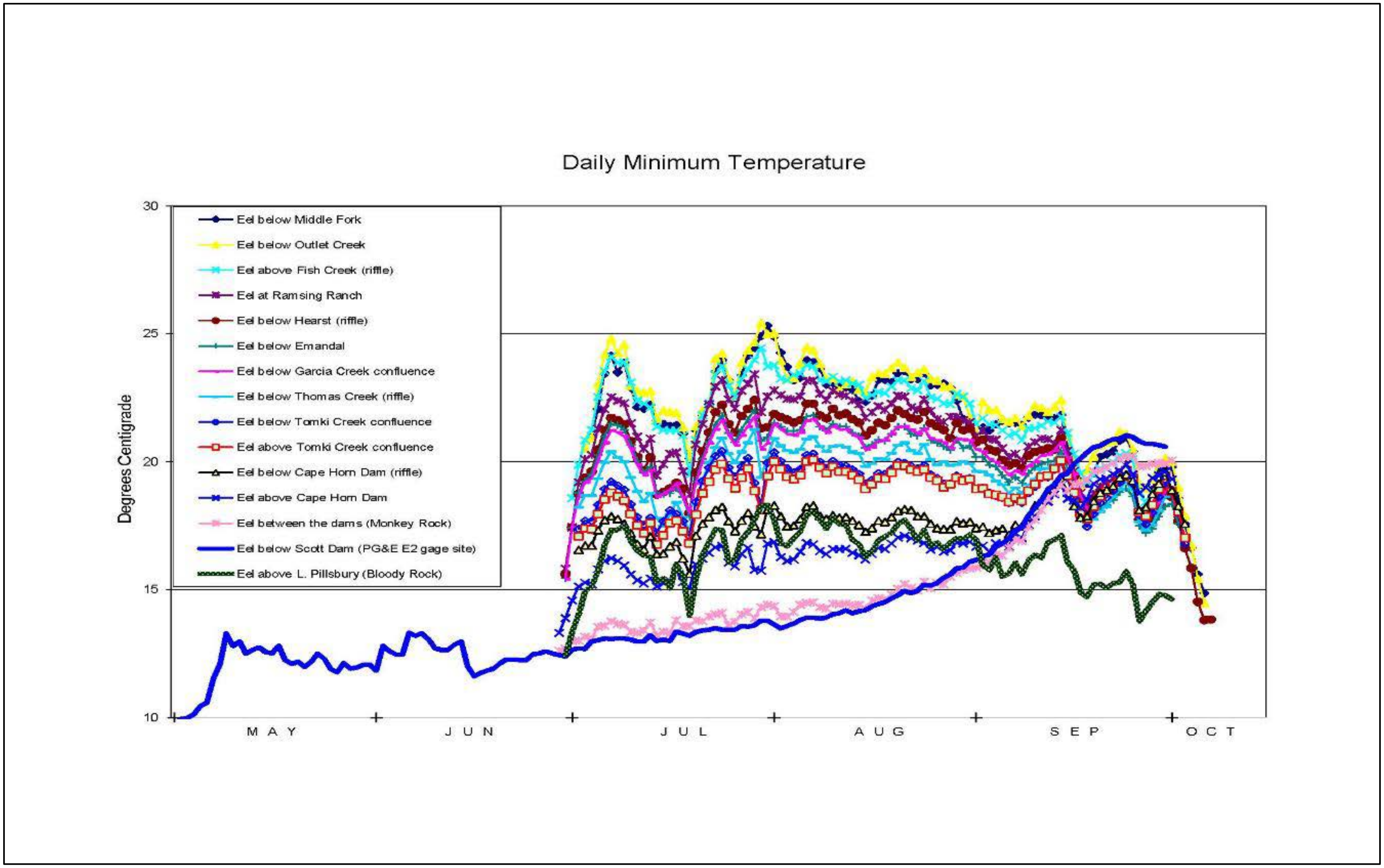


Figure 23. Minimum Daily Water Temperatures at Selected Eel River Sites in 2012

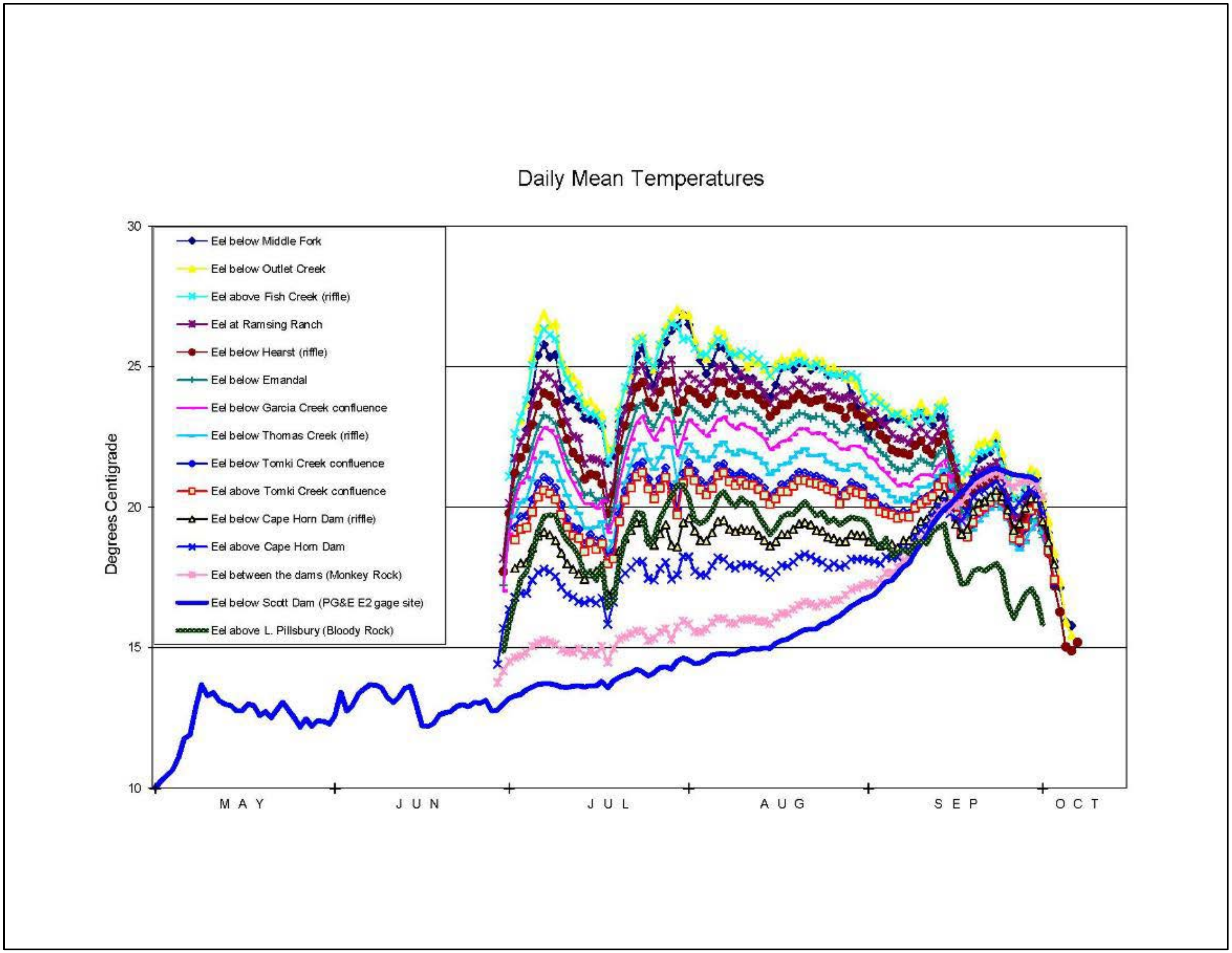


Figure 24. Mean Daily Water Temperatures at Selected Eel River Sites in 2012

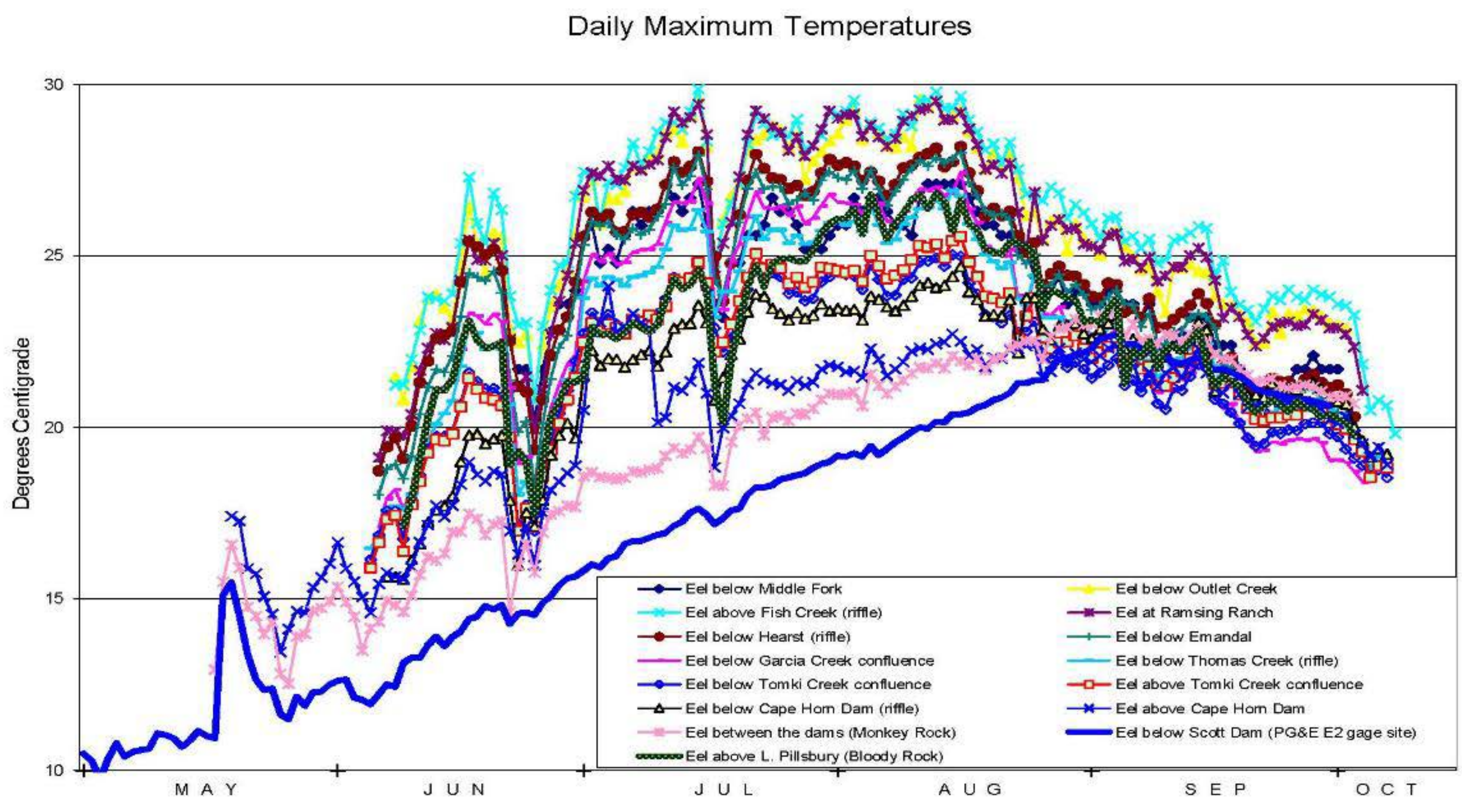


Figure 25. Maximum Daily Water Temperatures at Selected Eel River Sites in 2013

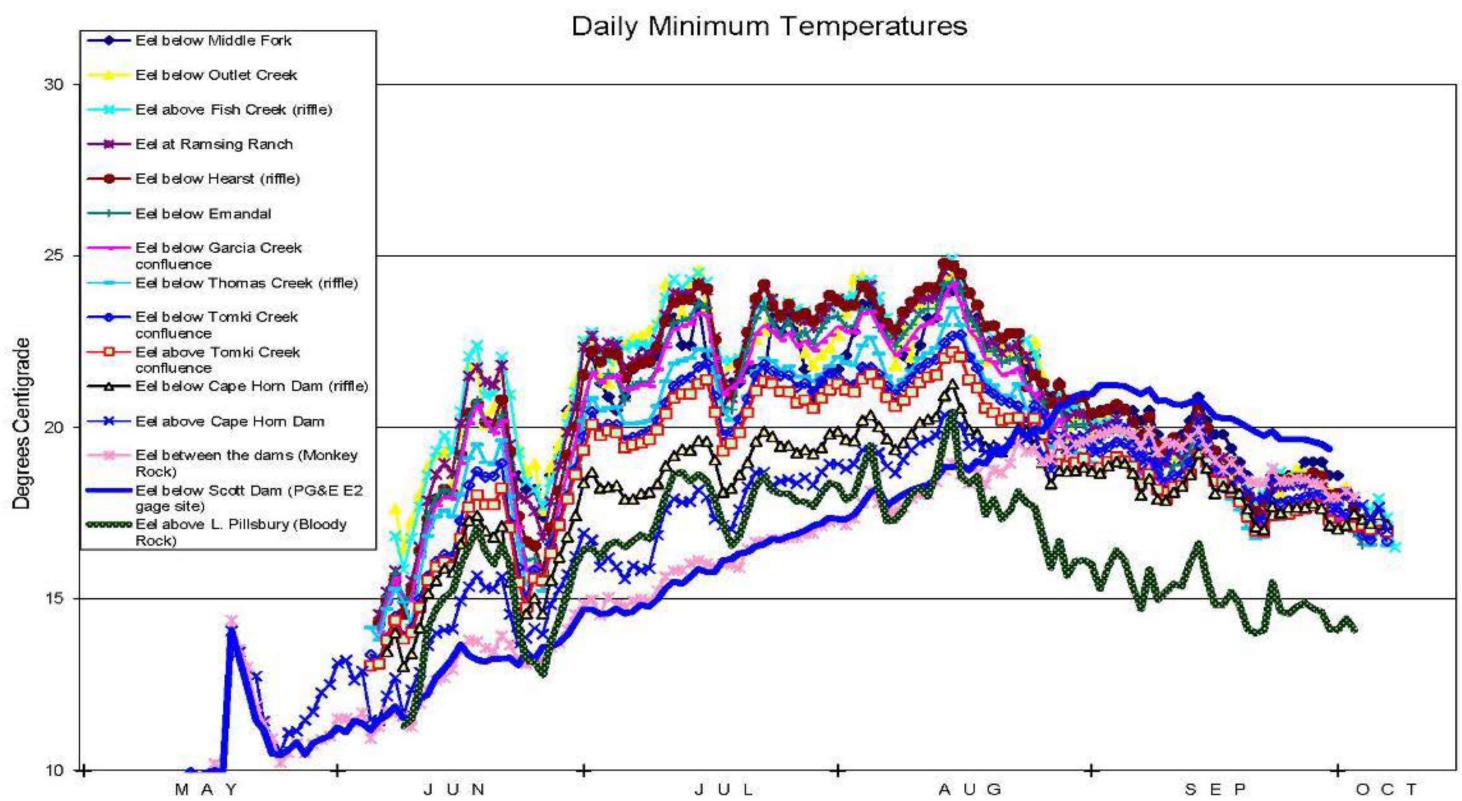


Figure 26. Minimum Daily Water Temperatures at Selected Eel River Sites in 2013

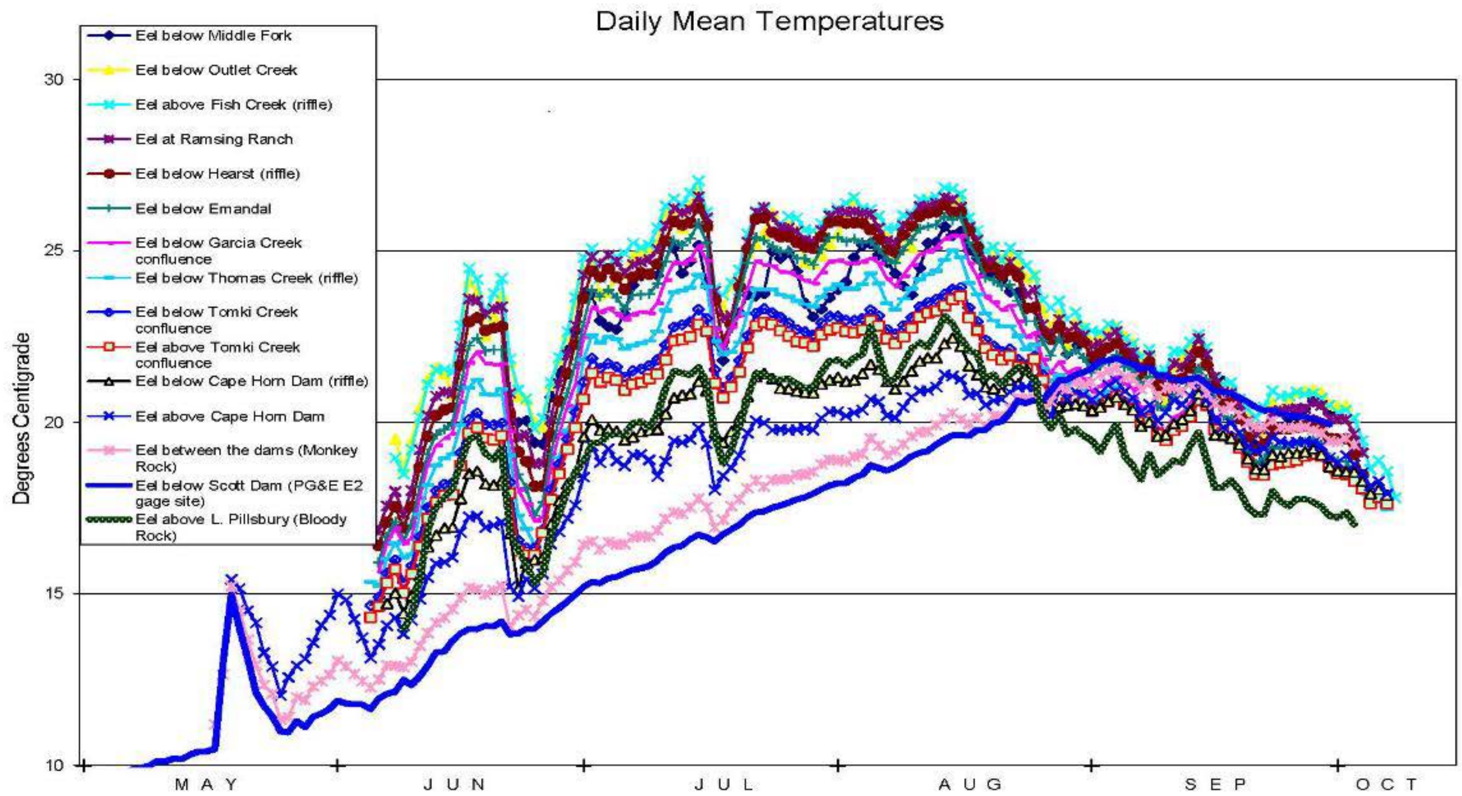


Figure 27. Mean Daily Water Temperatures at Selected Eel River Sites in 2013

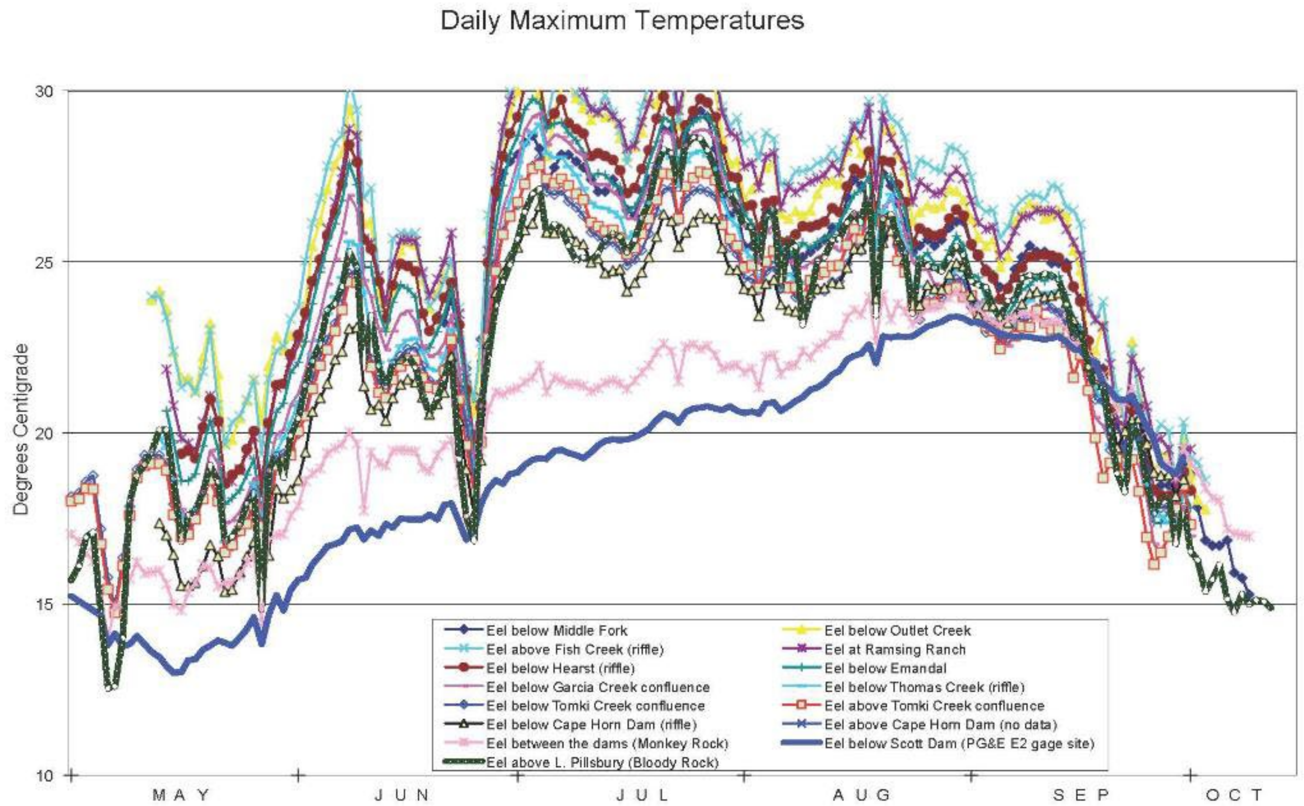


Figure 28. Maximum Daily Water Temperatures at Selected Eel River Sites in 2014

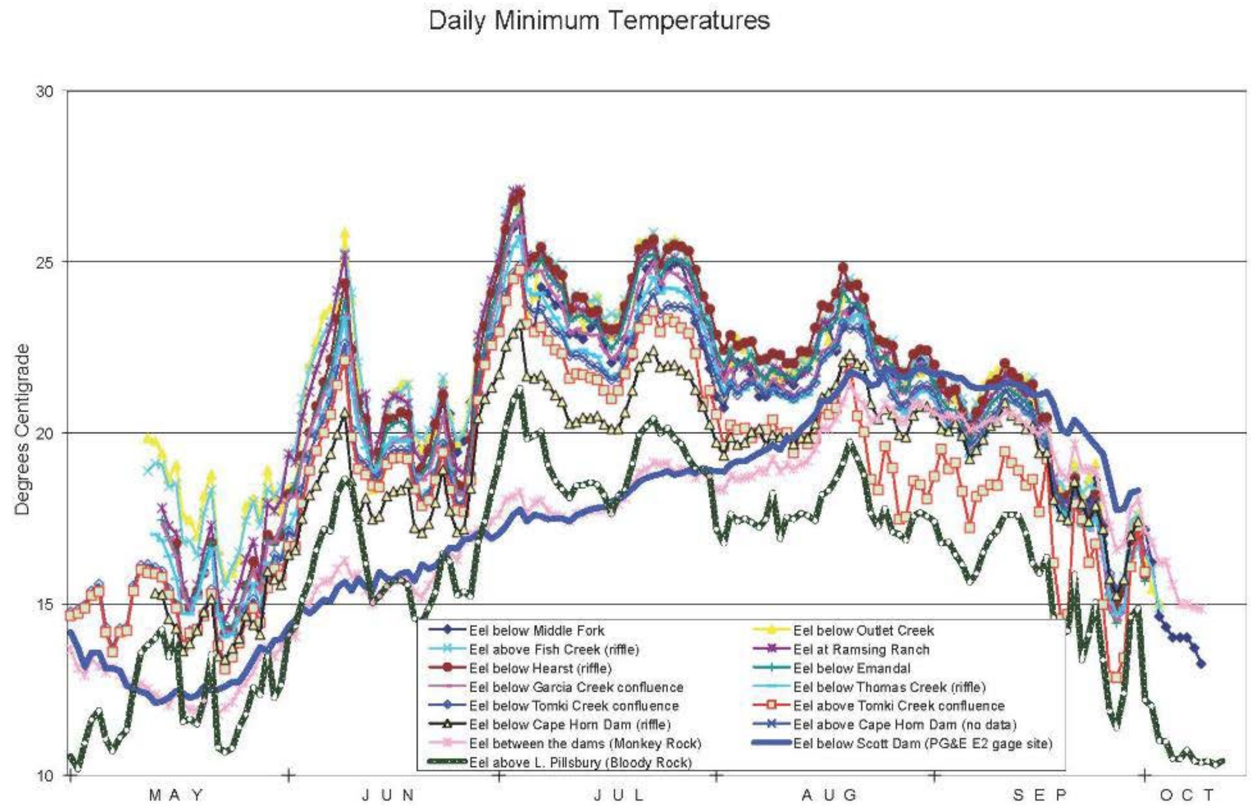


Figure 29. Minimum Daily Water Temperatures at Selected Eel River Sites in 2014

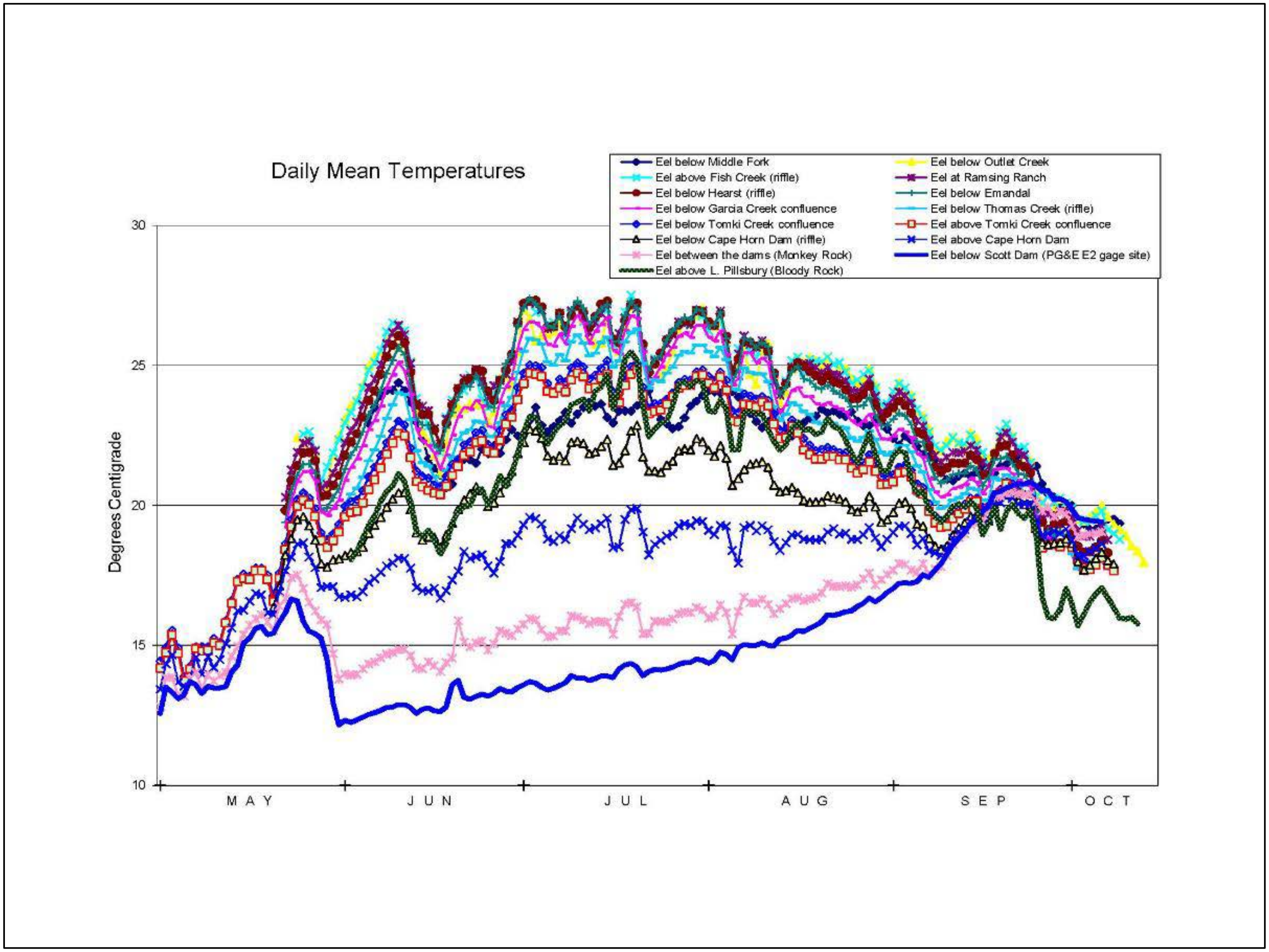


Figure 30. Mean Daily Water Temperatures at Selected Eel River Sites in 2014

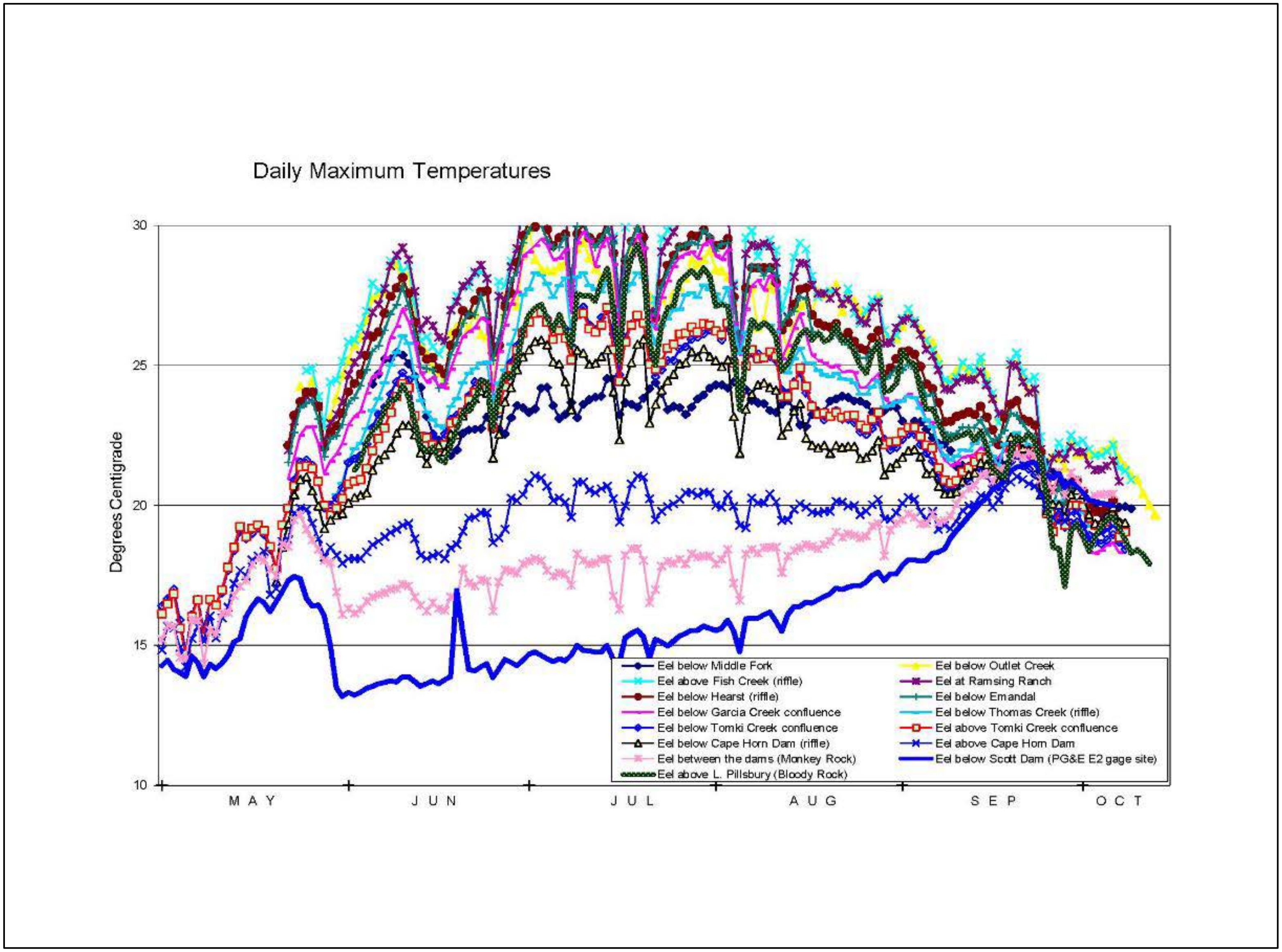


Figure 31. Maximum Daily Water Temperatures at Selected Eel River Sites in 2015

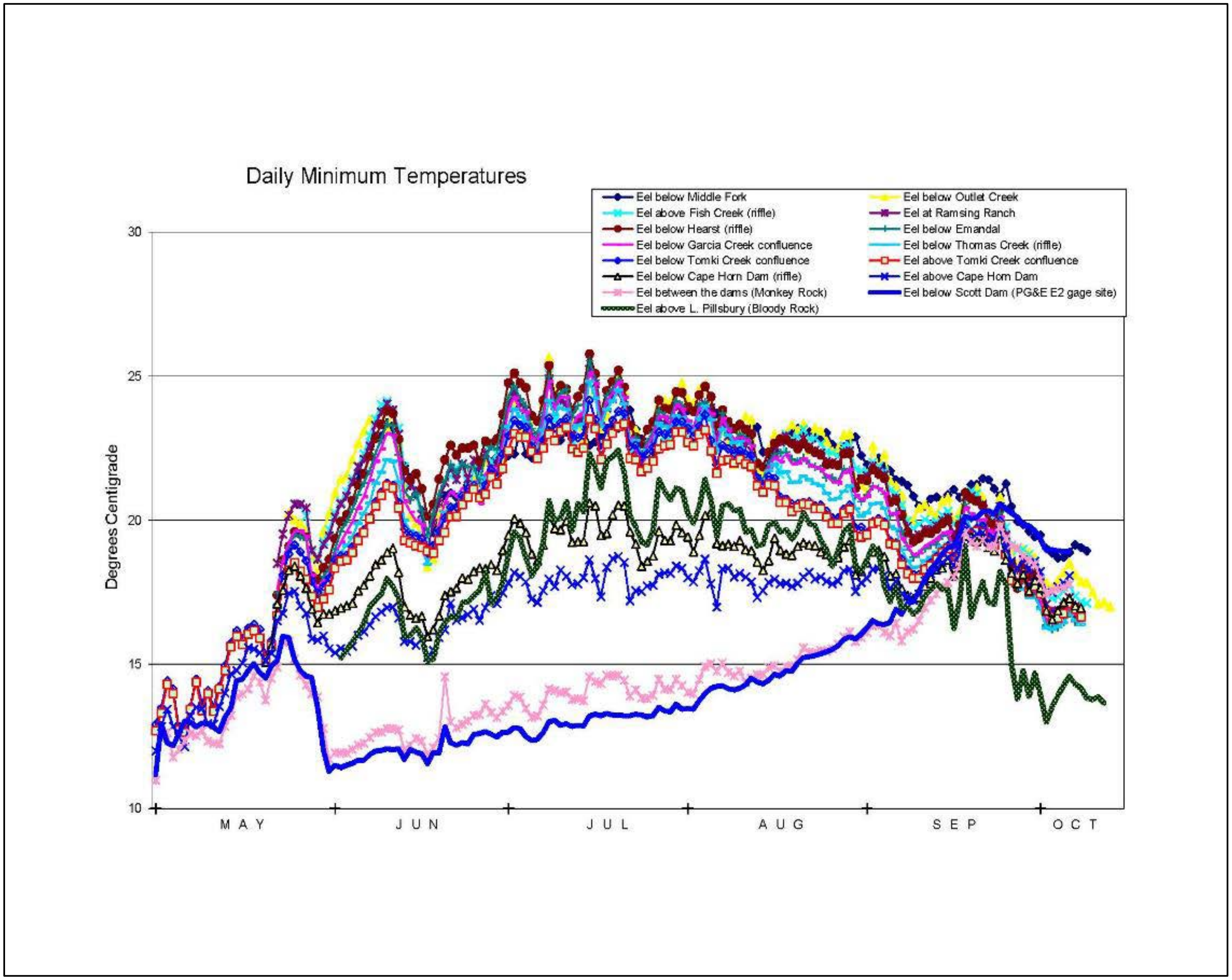


Figure 32. Minimum Daily Water Temperatures at Selected Eel River Sites in 2015

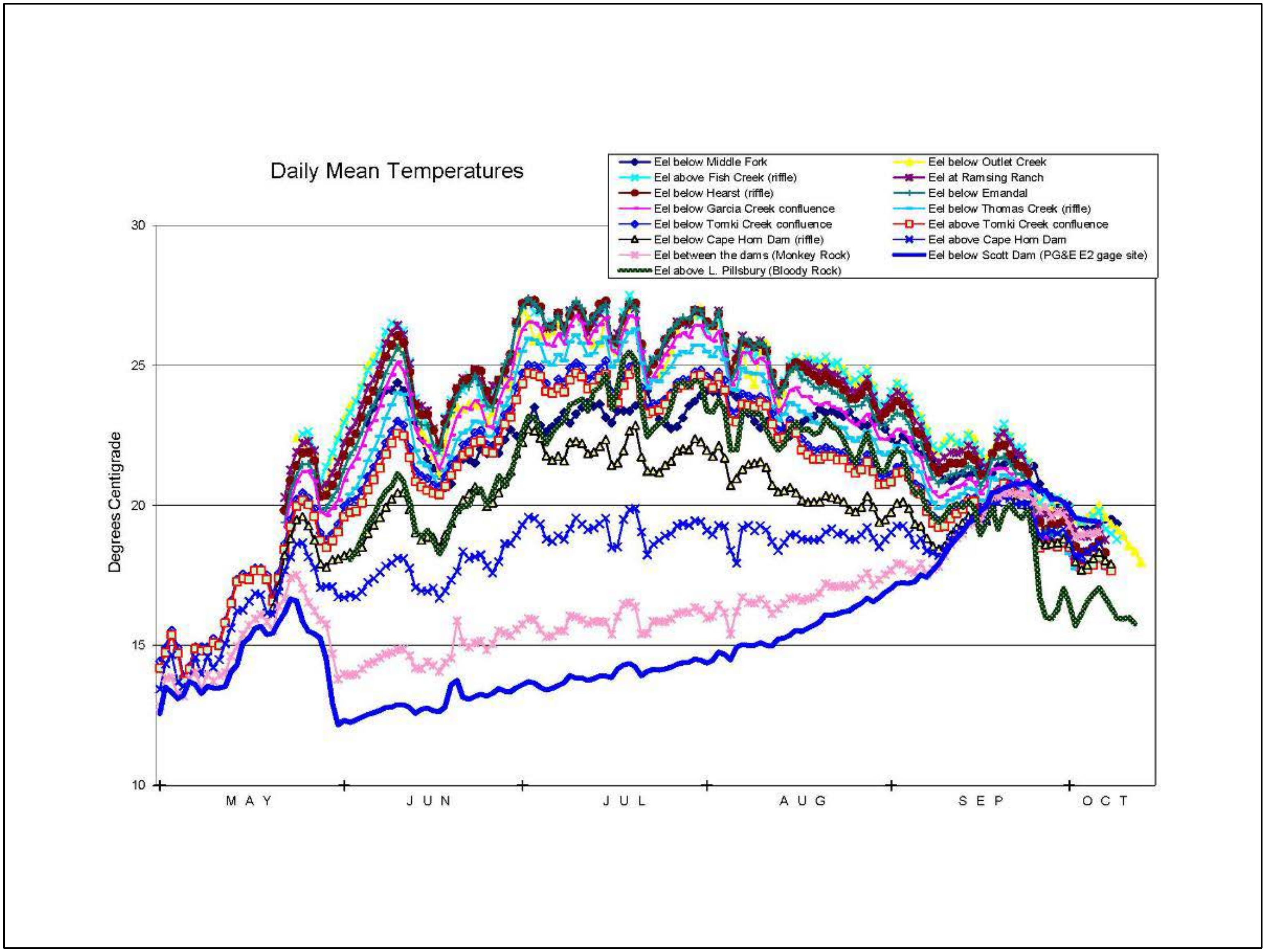


Figure 33. Mean Daily Water Temperatures at Selected Eel River Sites in 2015

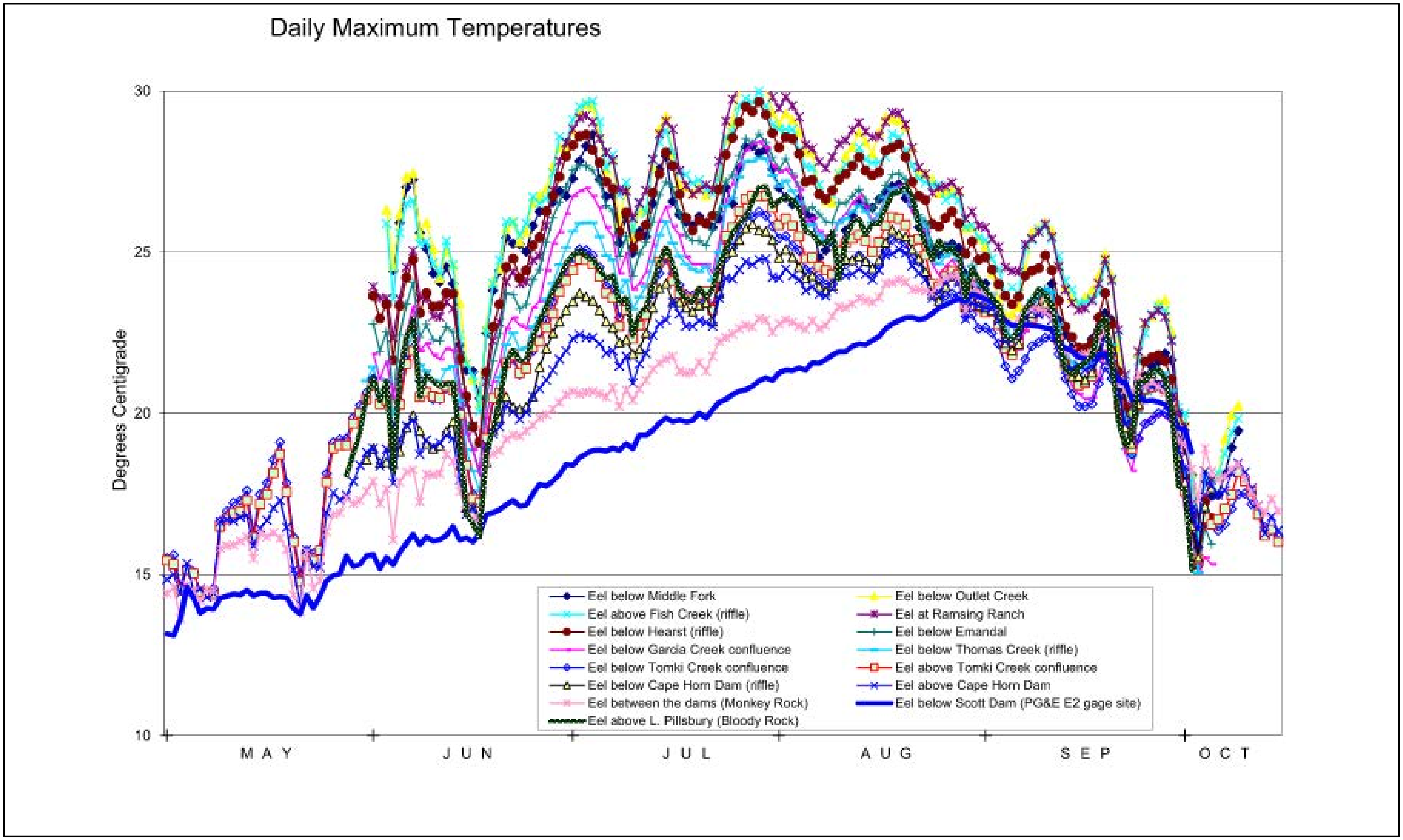


Figure 34. Maximum Daily Water Temperatures at Selected Eel River Sites in 2016

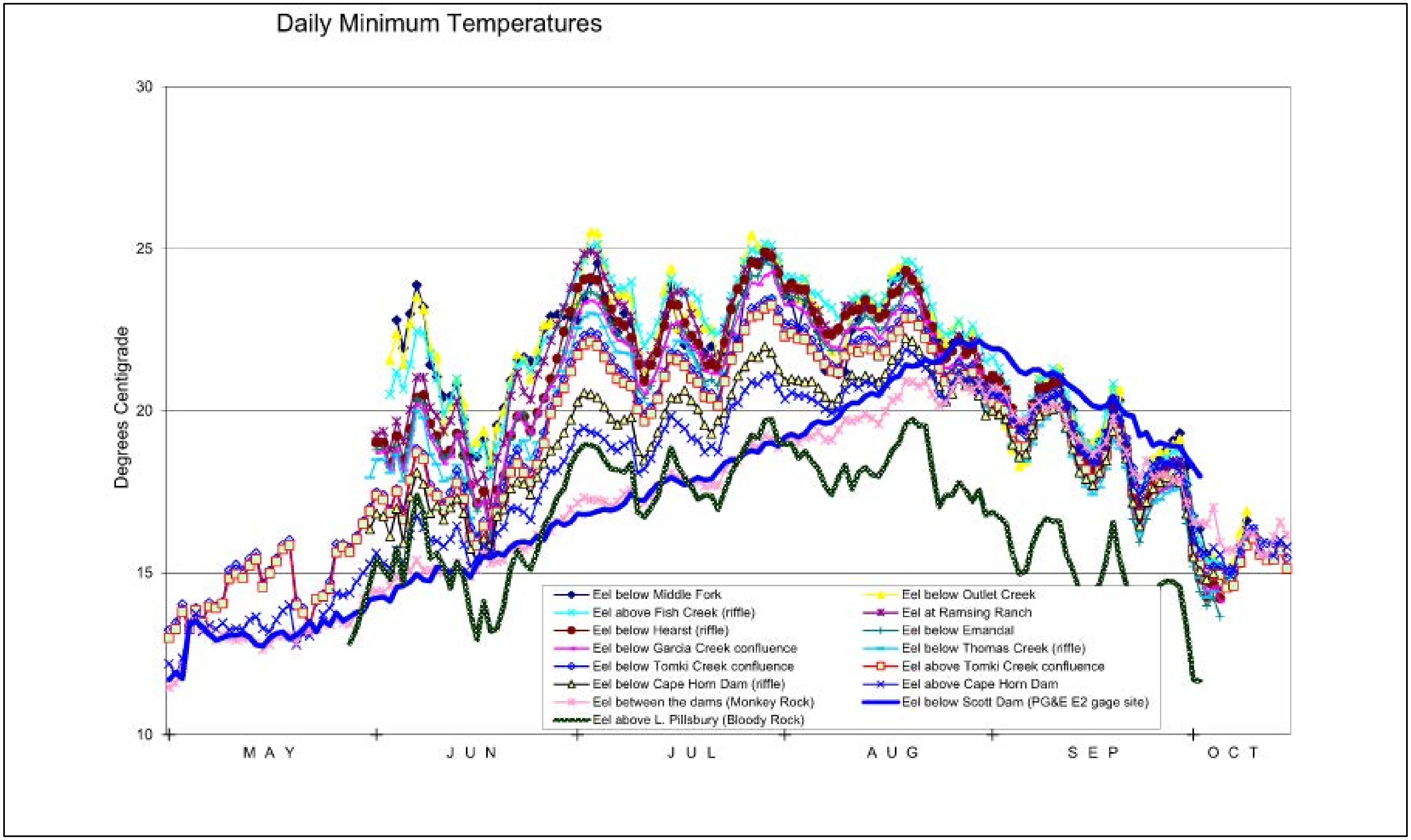


Figure 35. Minimum Daily Water Temperatures at Selected Eel River Sites in 2016

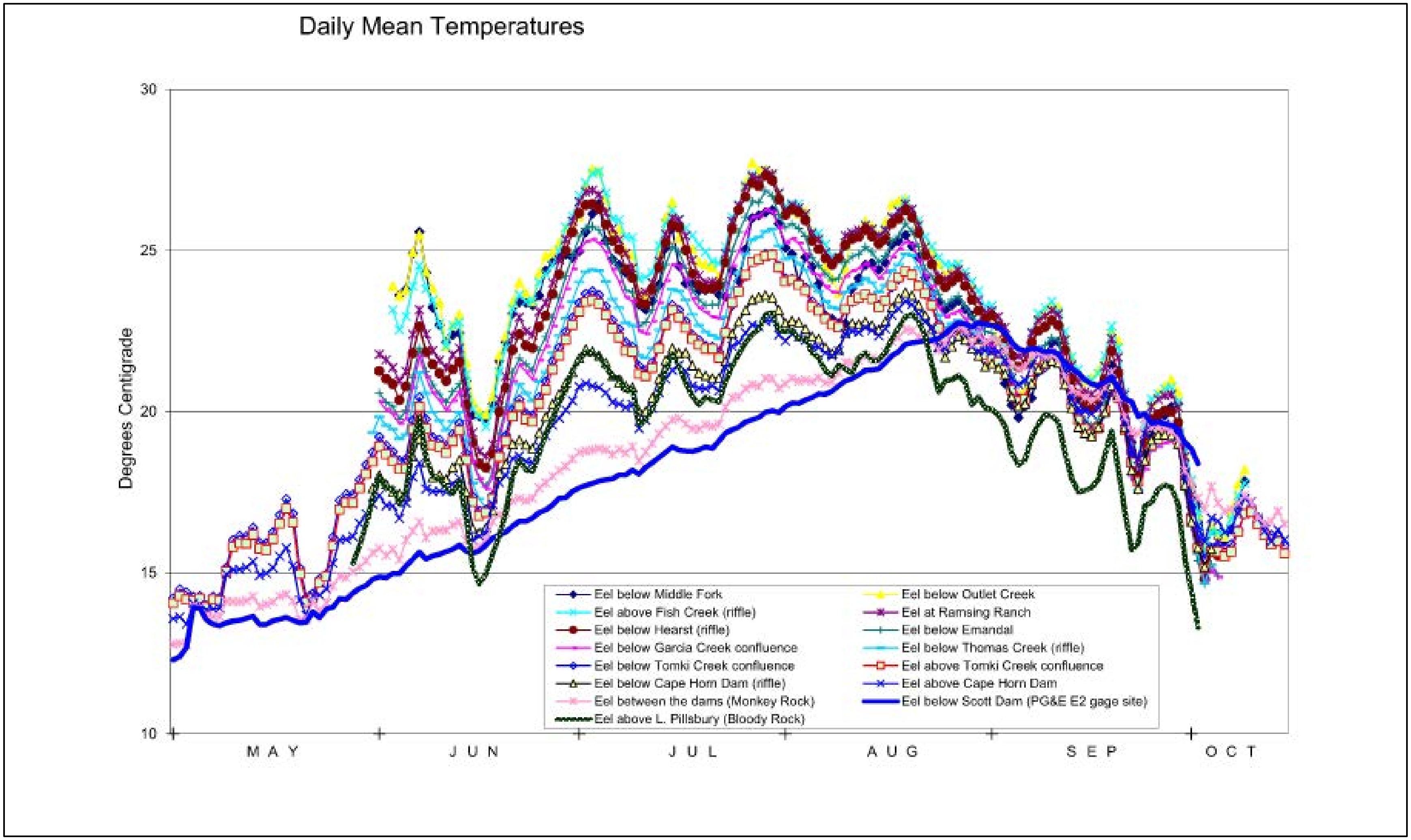


Figure 36. Mean Daily Water Temperatures at Selected Eel River Sites in 2016

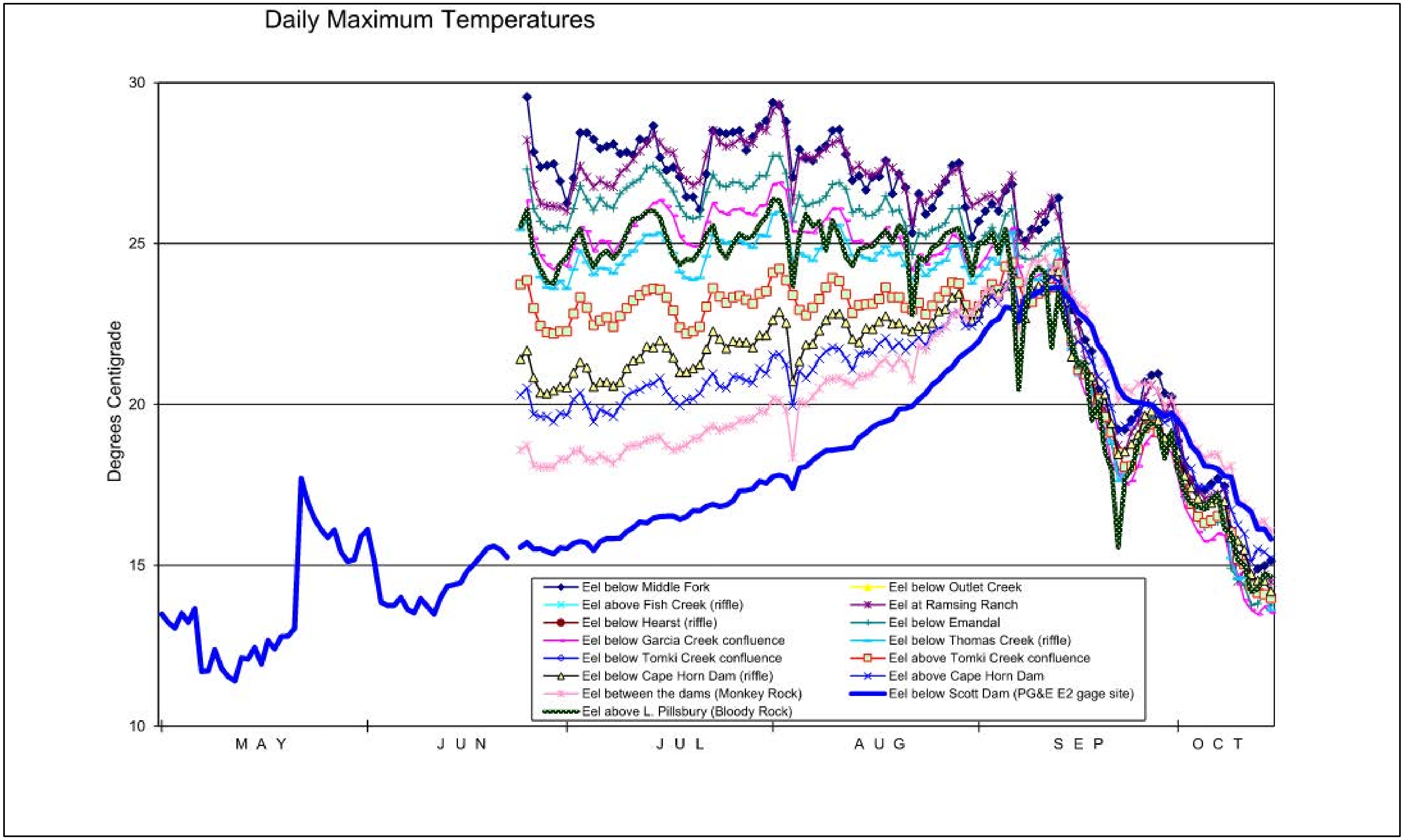


Figure 37. Maximum Daily Water Temperatures at Selected Eel River Sites in 2017

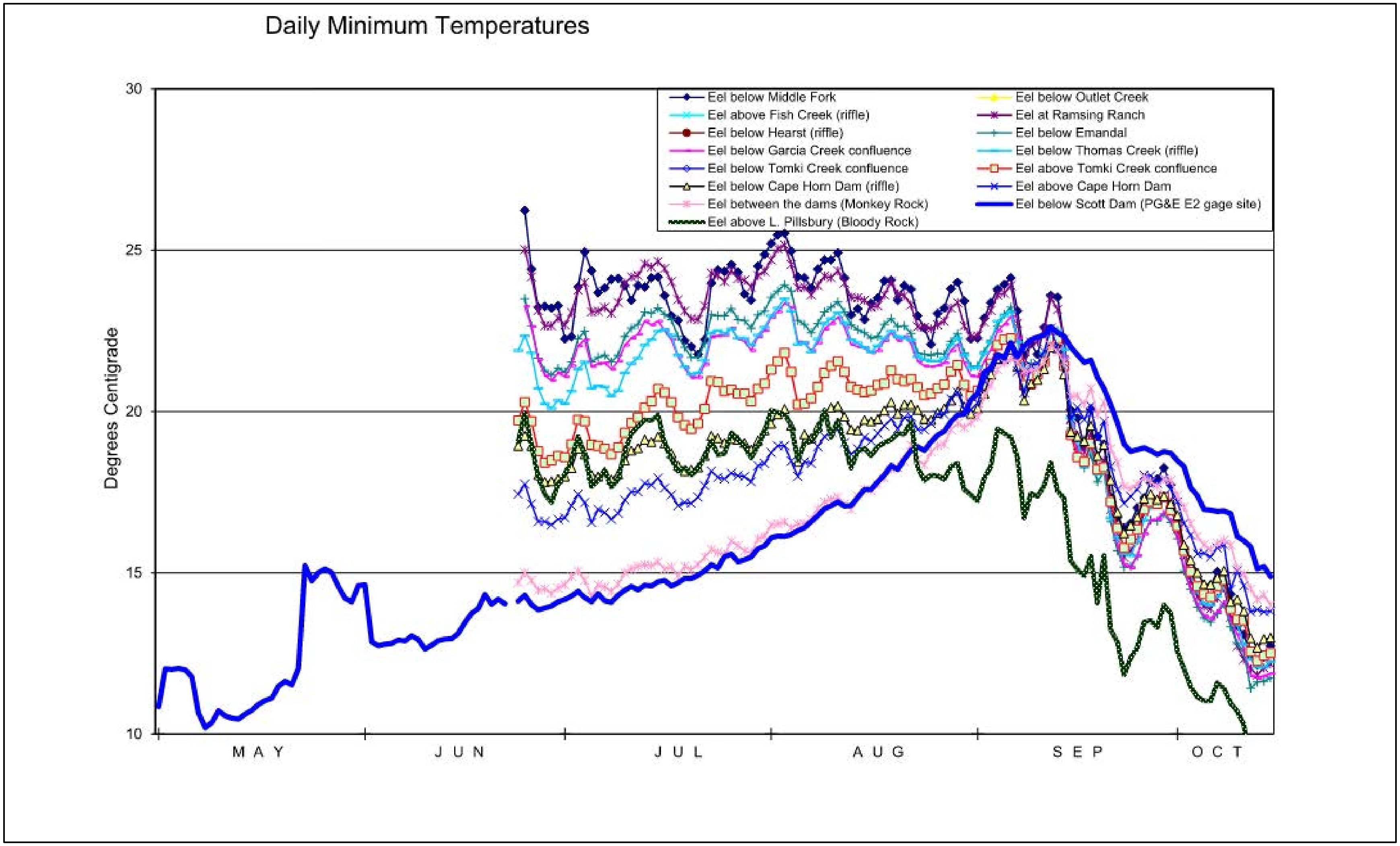


Figure 38. Minimum Daily Water Temperatures at Selected Eel River Sites in 2017

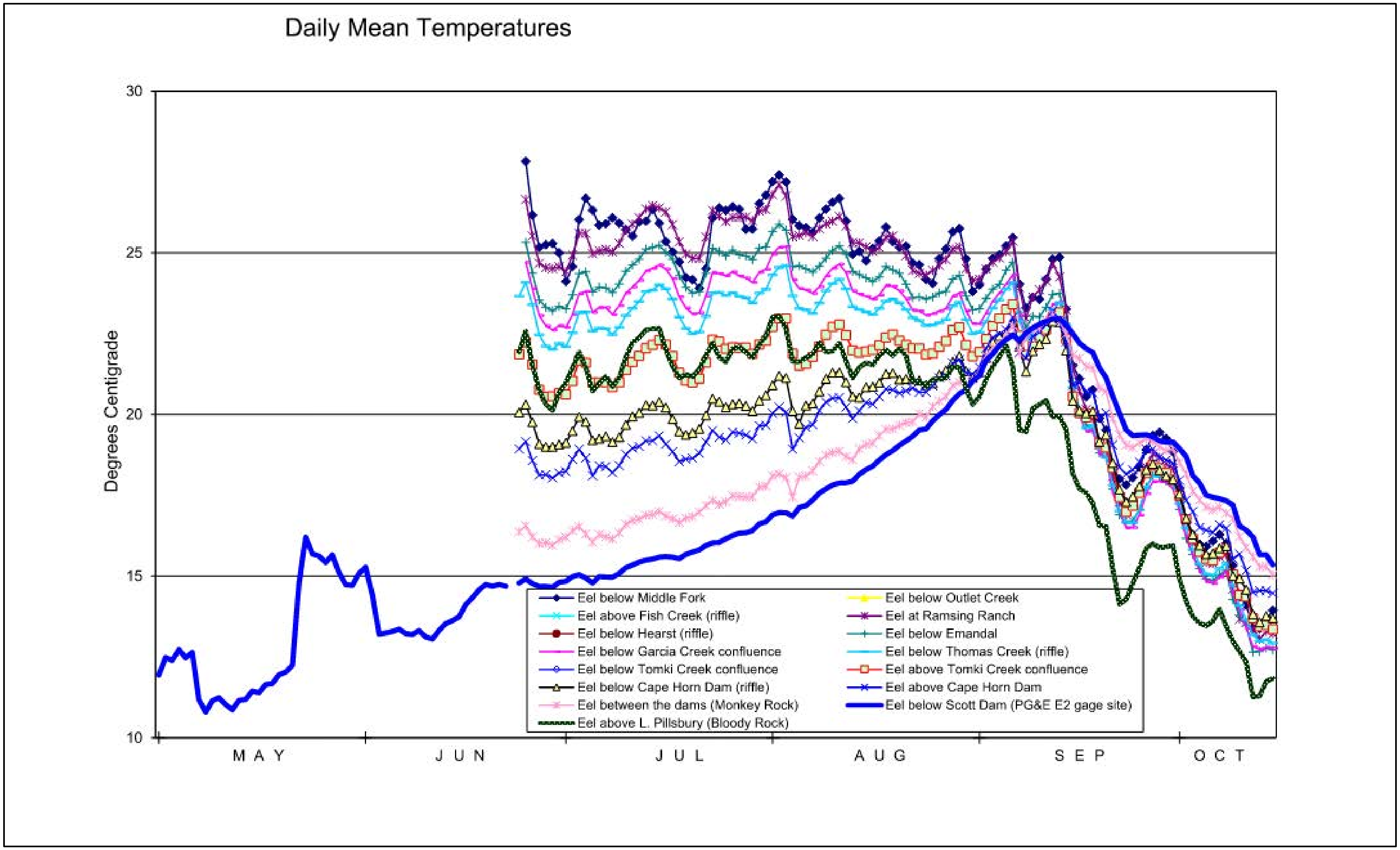


Figure 39. Mean Daily Water Temperatures at Selected Eel River Sites in 2017

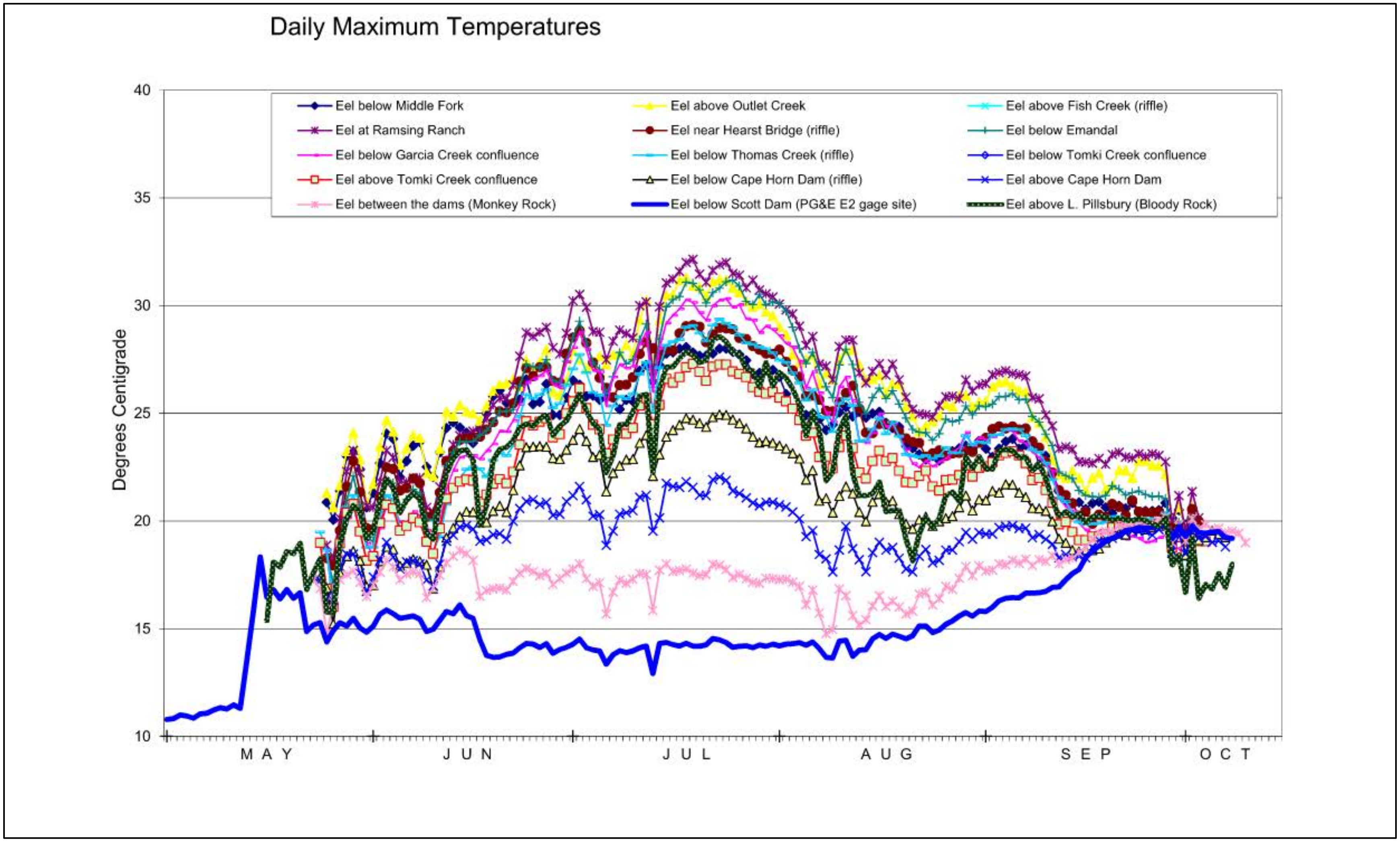


Figure 40. Maximum Daily Water Temperatures at Selected Eel River Sites in 2018

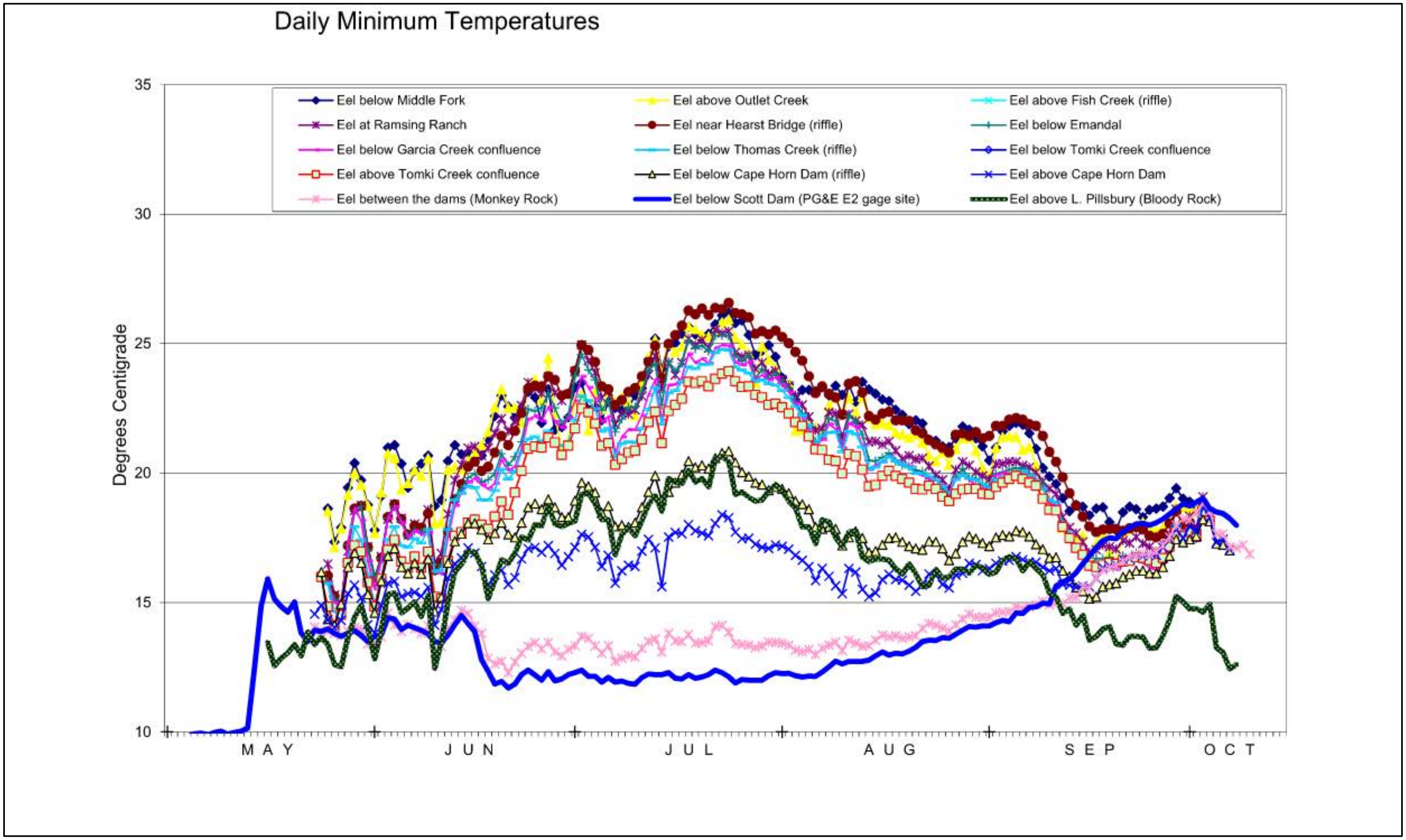


Figure 41. Minimum Daily Water Temperatures at Selected Eel River Sites in 2018

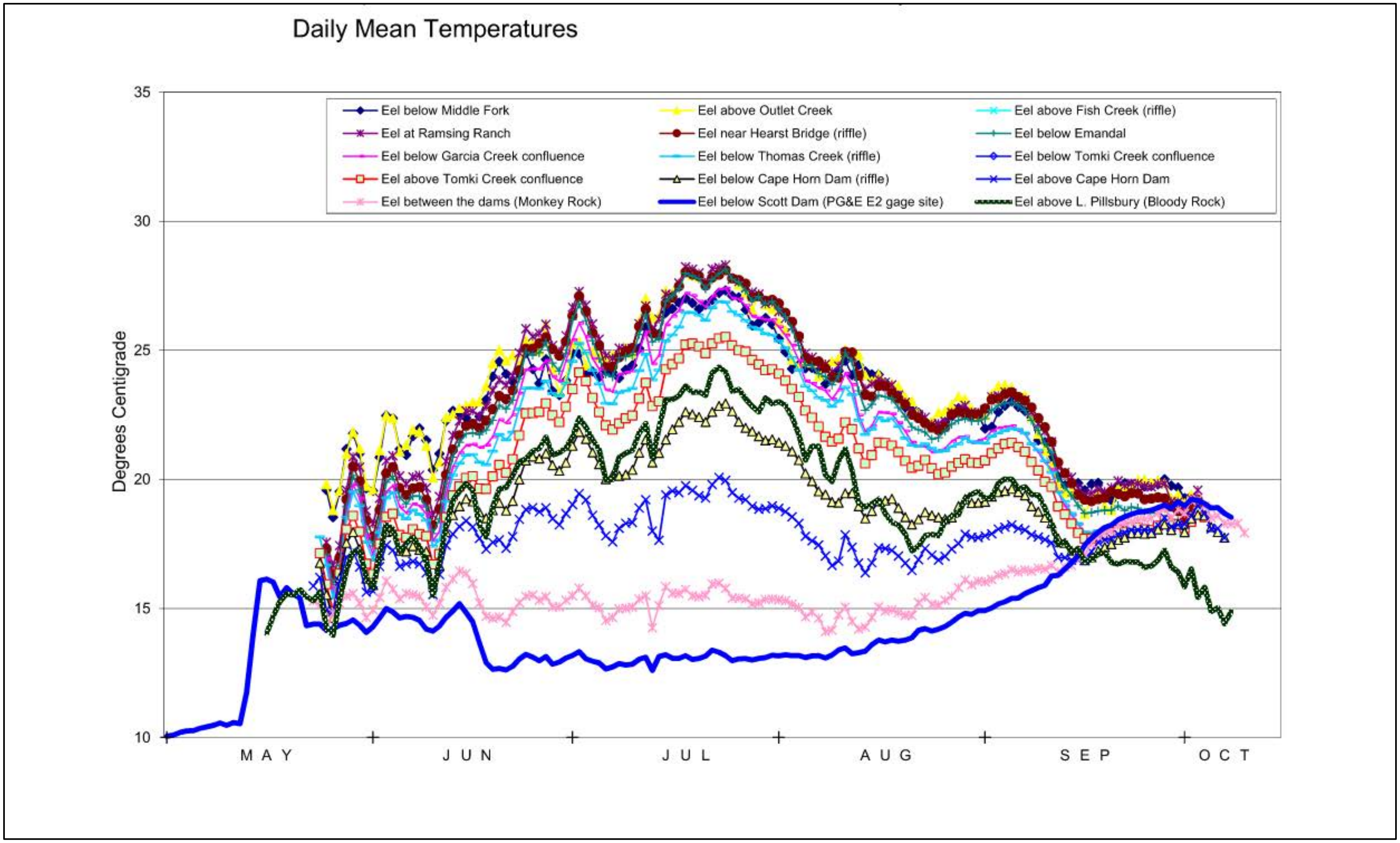


Figure 42. Mean Daily Water Temperatures at Selected Eel River Sites in 2018

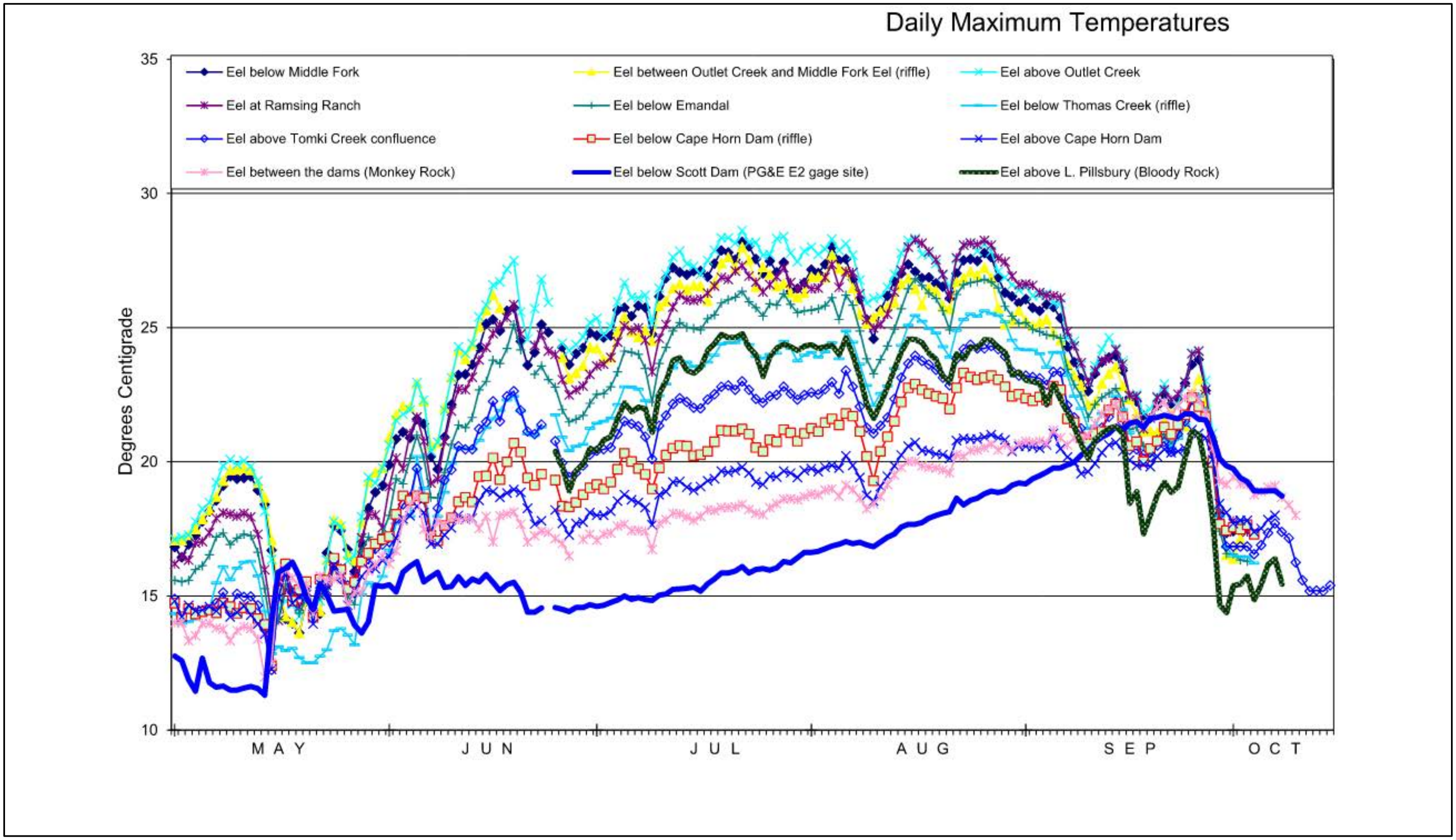


Figure 43. Maximum Daily Water Temperatures at Selected Eel River Sites in 2019

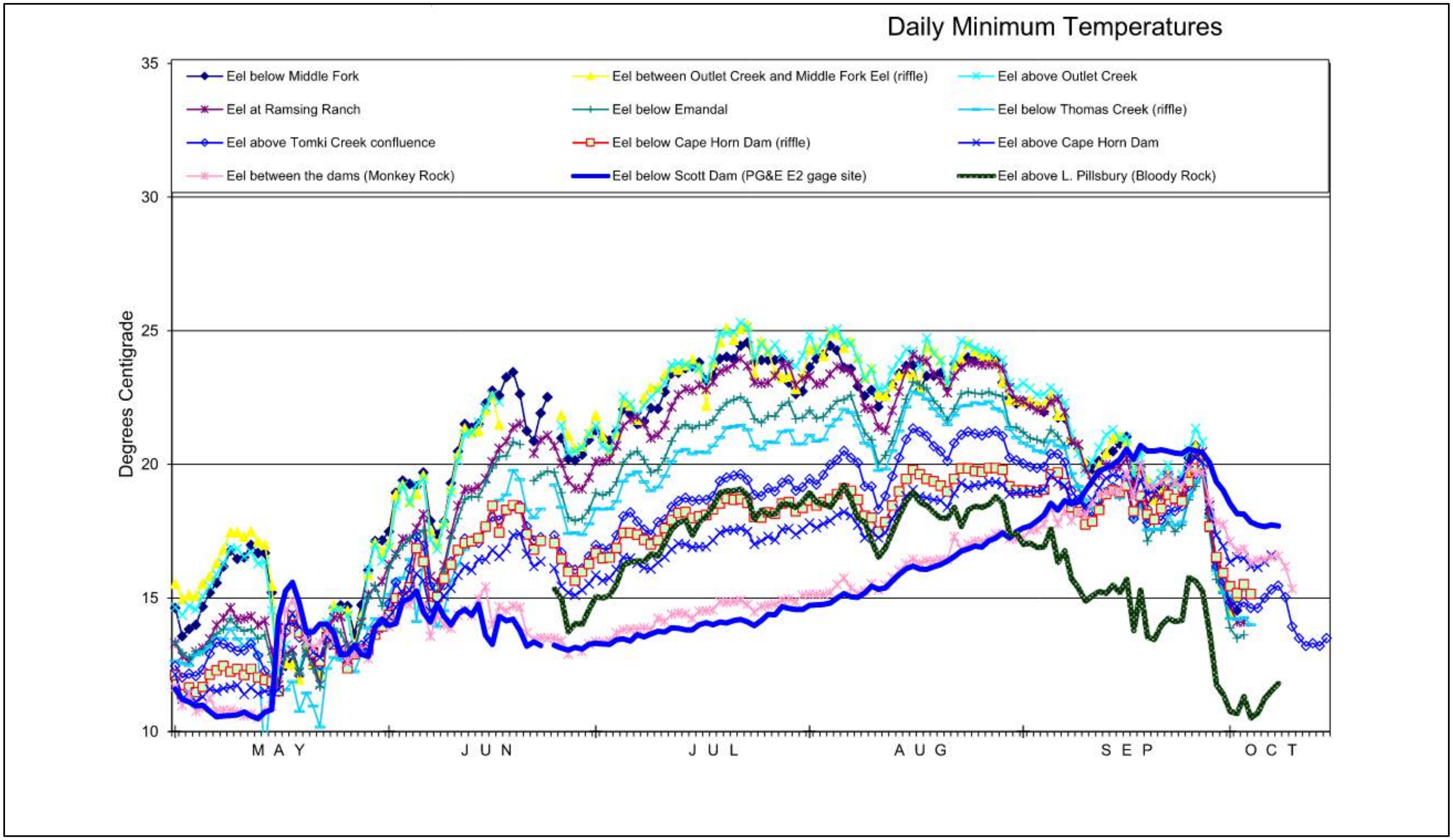


Figure 44. Minimum Daily Water Temperatures at Selected Eel River Sites in 2019

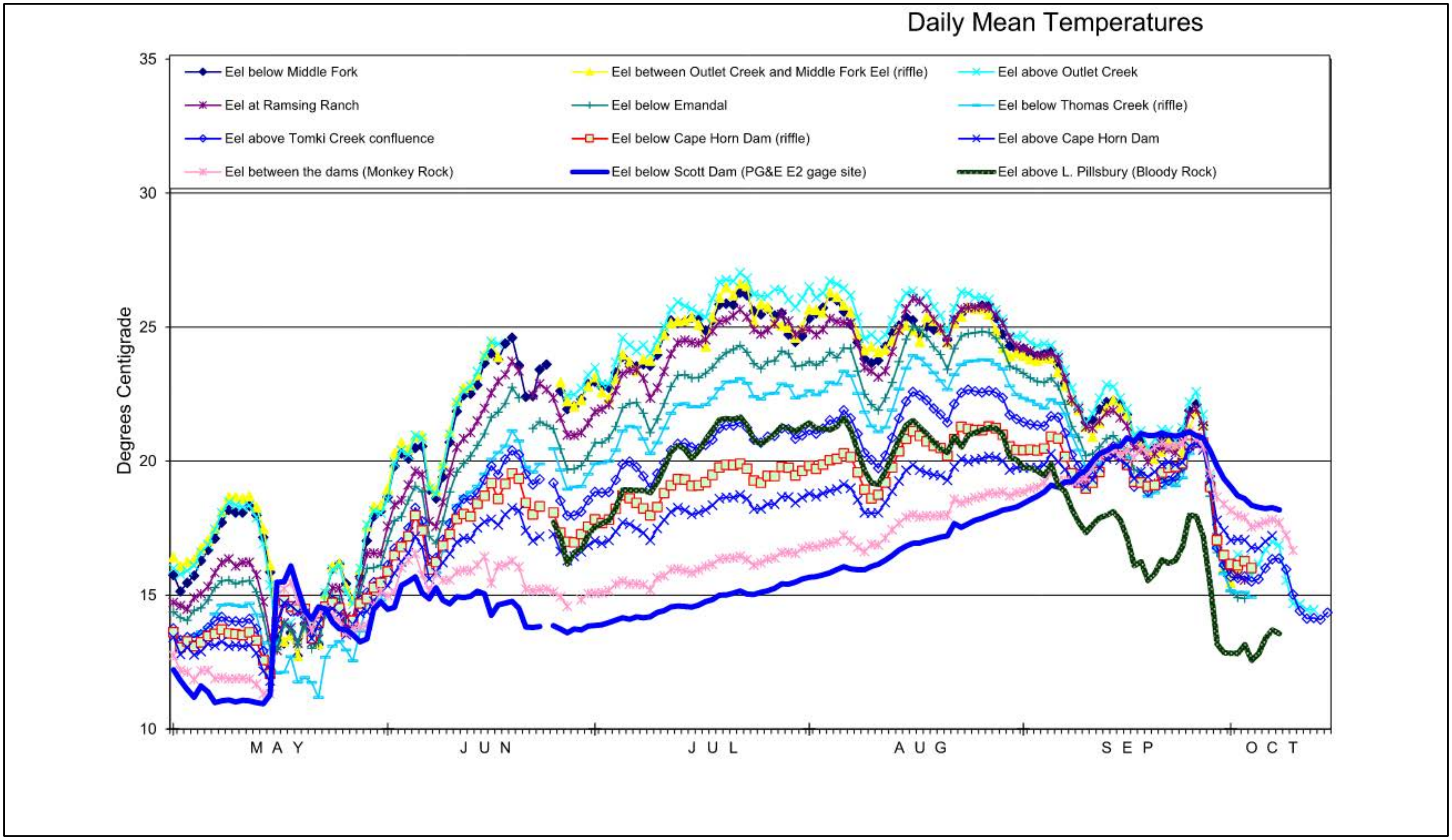


Figure 45. Mean Daily Water Temperatures at Selected Eel River Sites in 2019

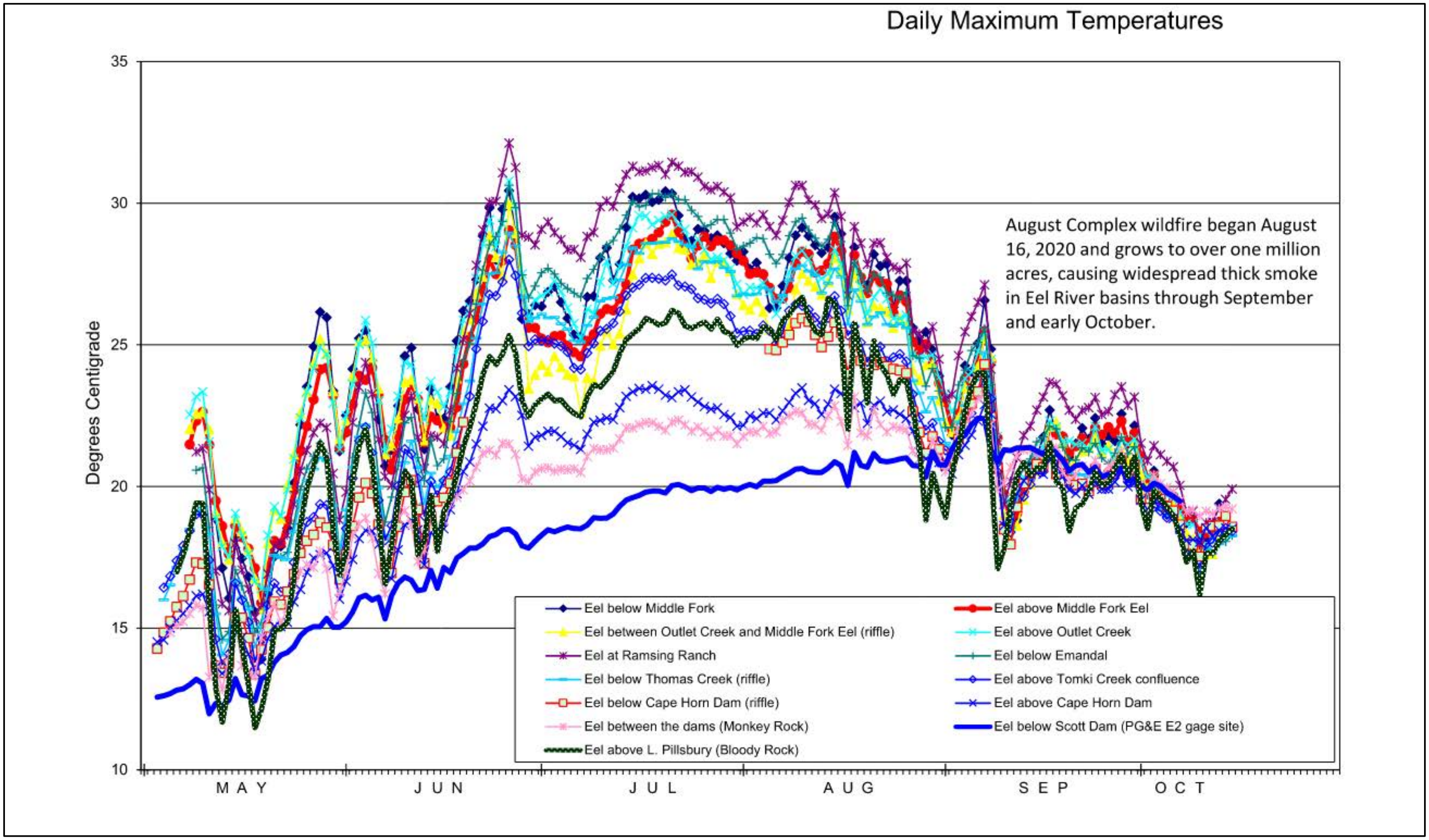


Figure 47. Maximum Daily Water Temperatures at Selected Eel River Sites in 2020

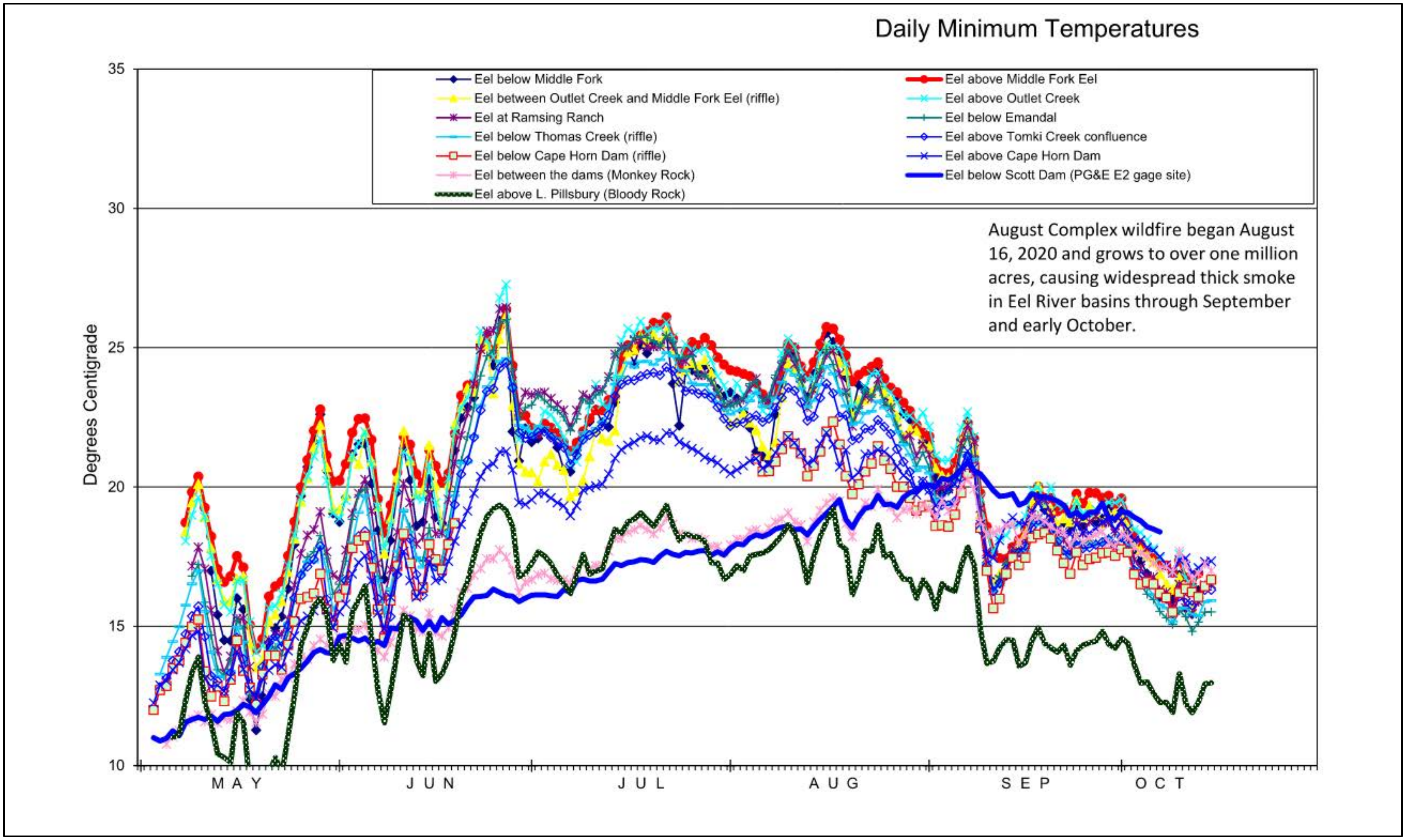


Figure 48. Minimum Daily Water Temperatures at Selected Eel River Sites in 2020

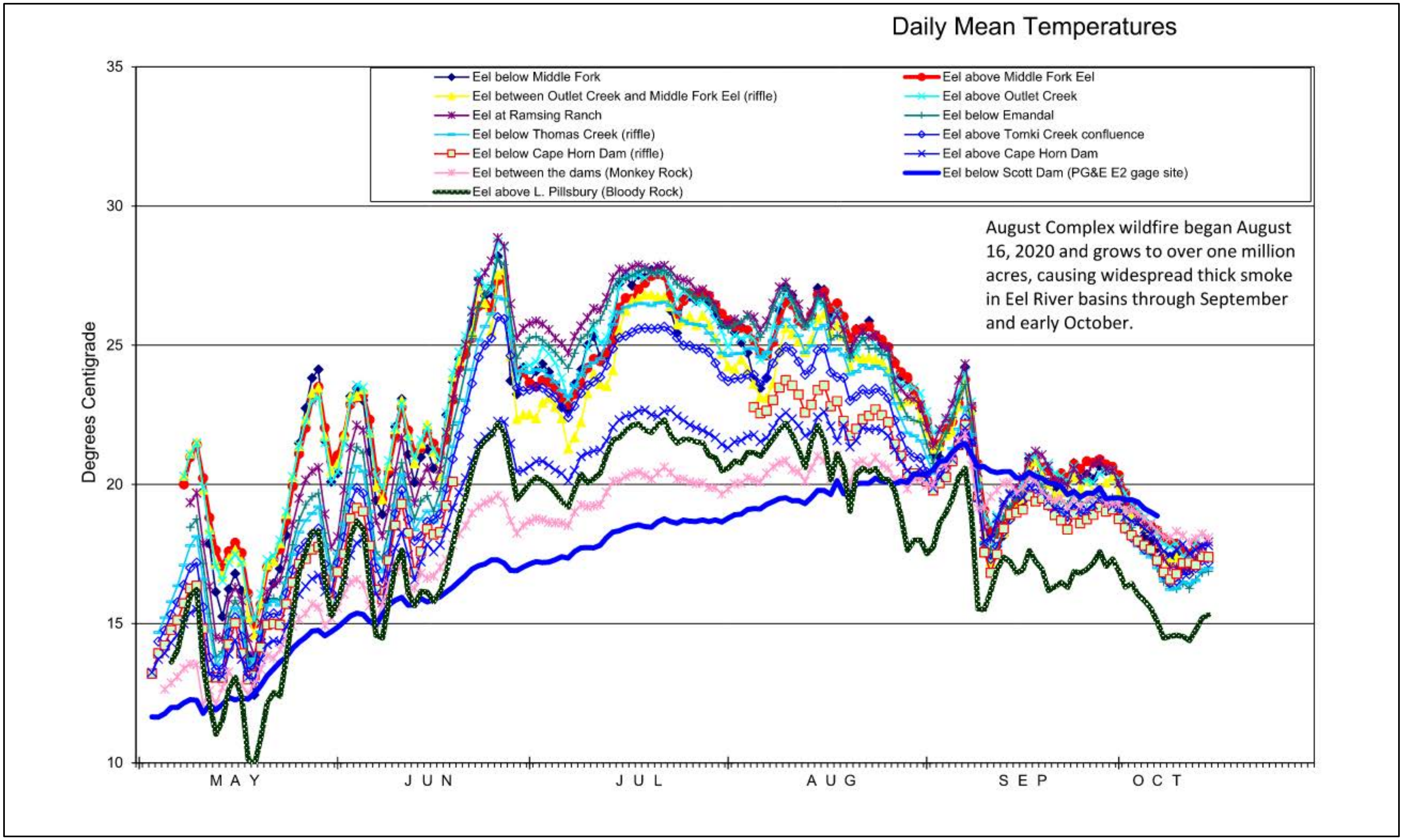


Figure 49. Mean Daily Water Temperatures at Selected Eel River Sites in 2020

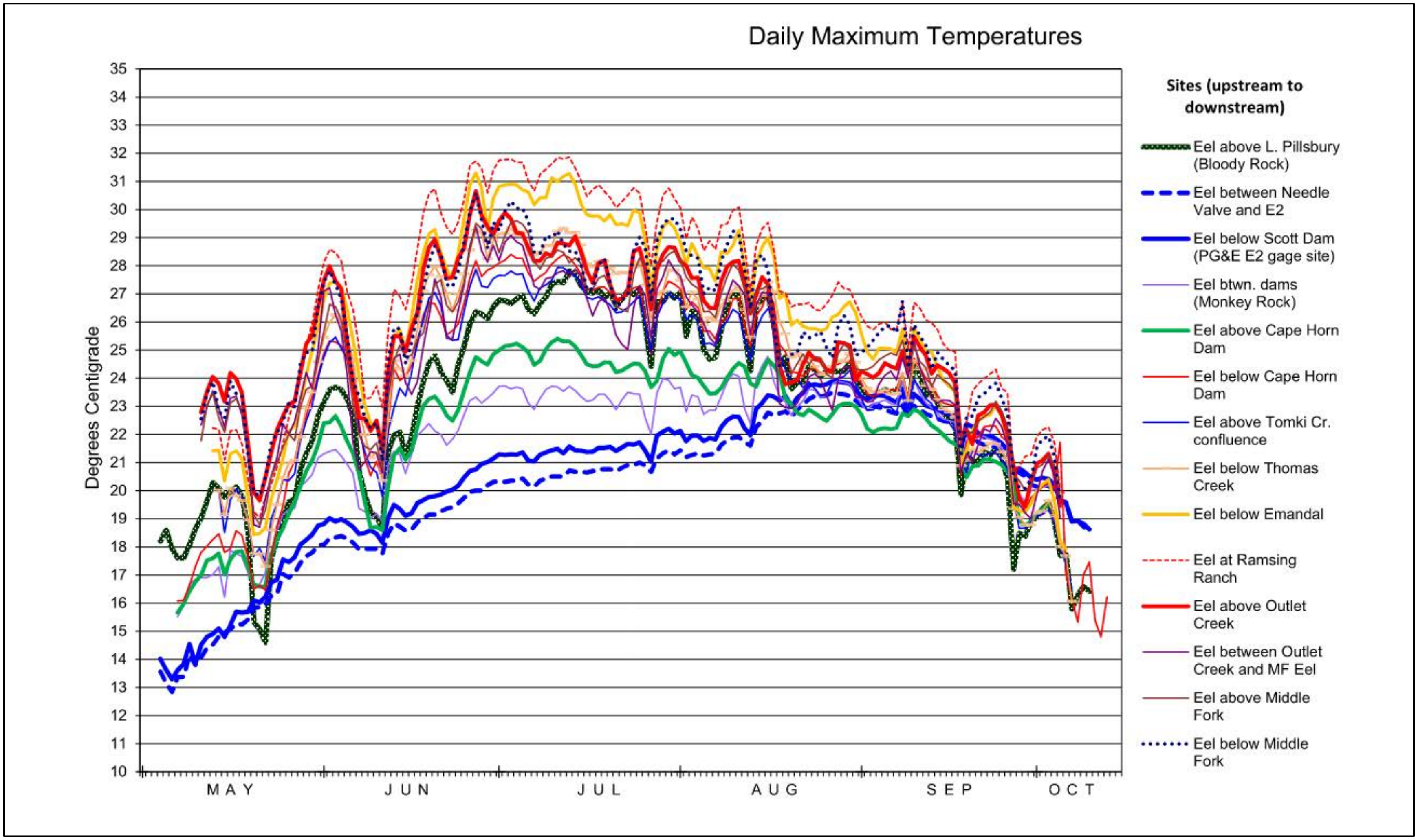


Figure 50. Maximum Daily Water Temperatures at Selected Eel River Sites in 2021

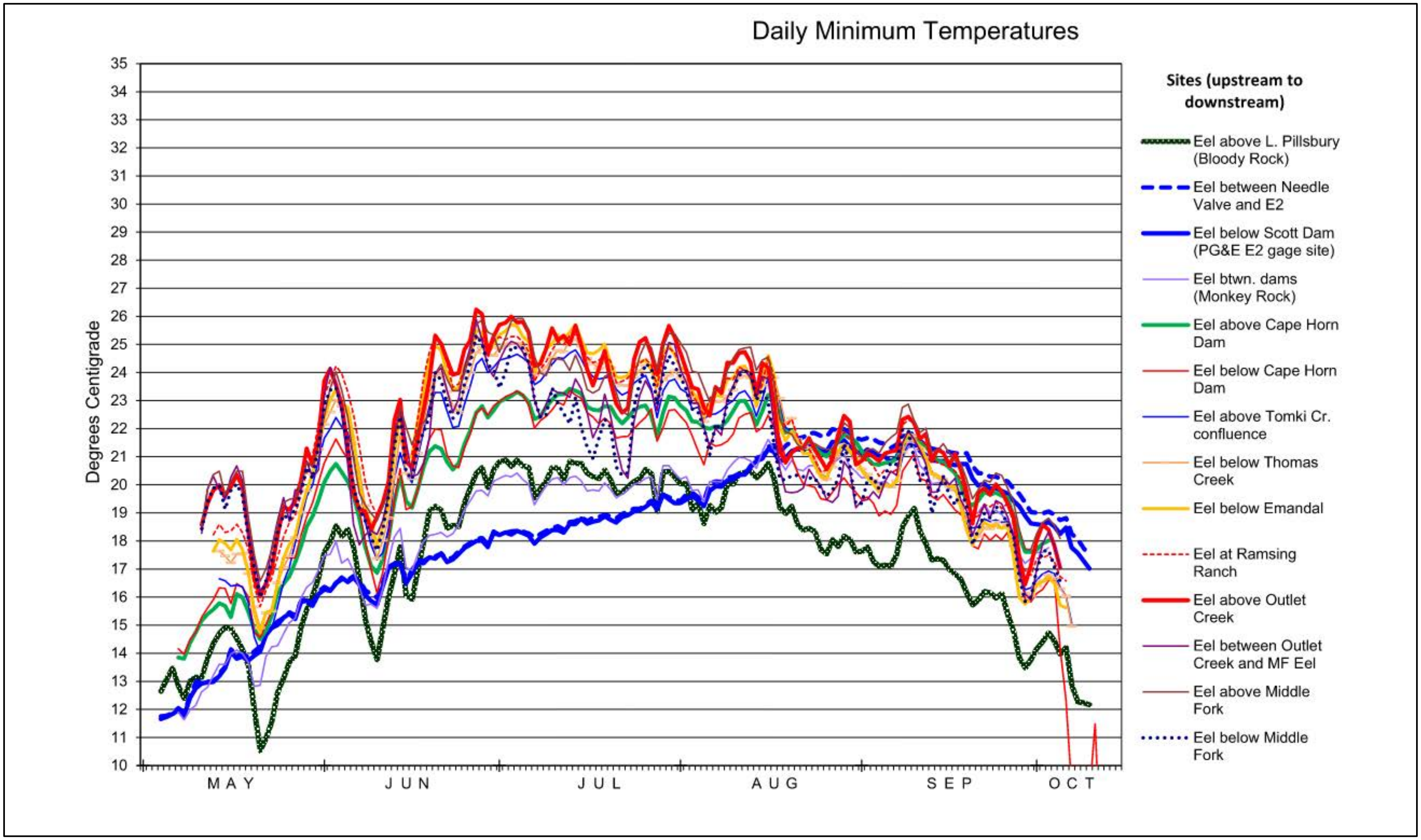


Figure 51. Minimum Daily Water Temperatures at Selected Eel River Sites in 2021

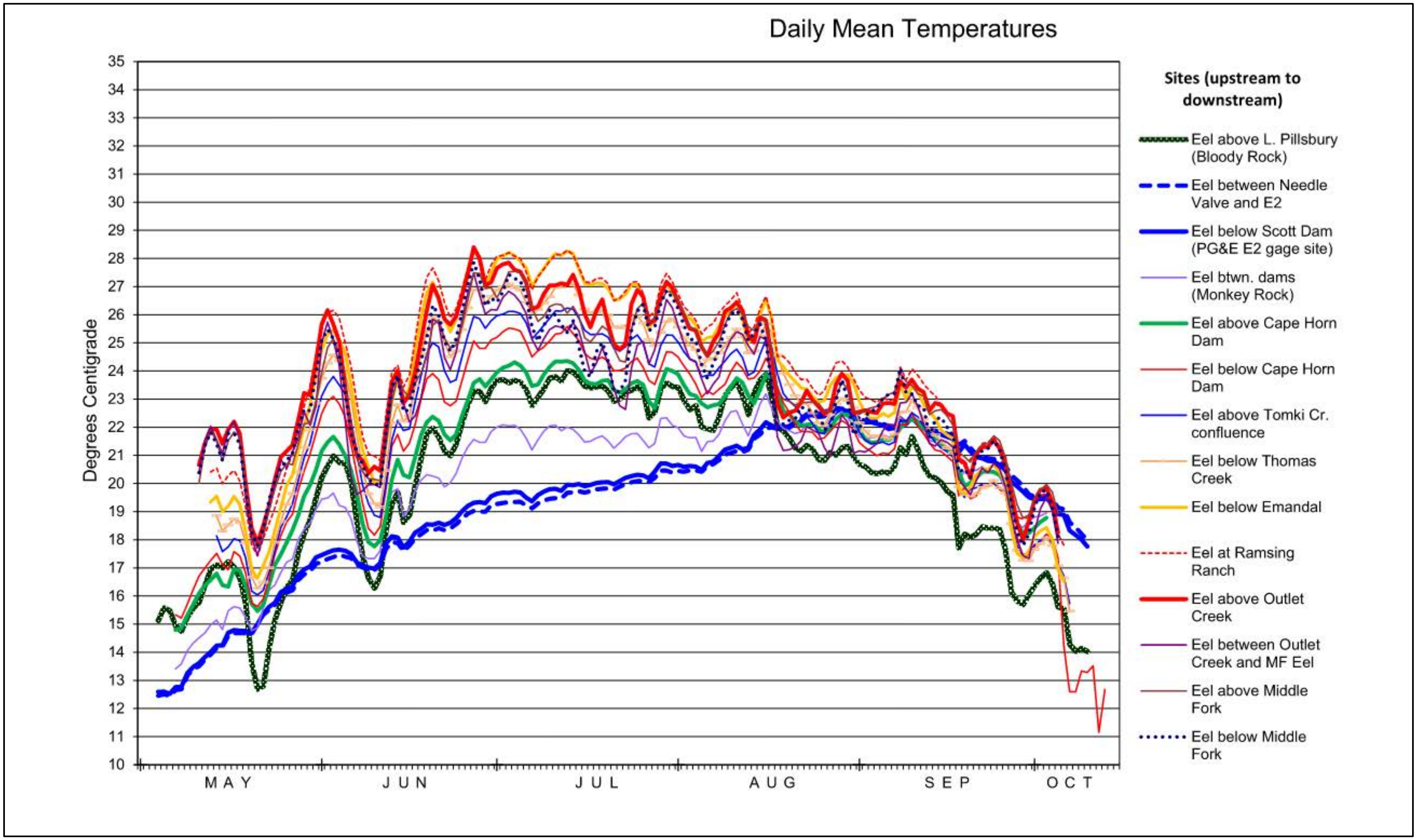


Figure 52. Mean Daily Water Temperatures at Selected Eel River Sites in 2021

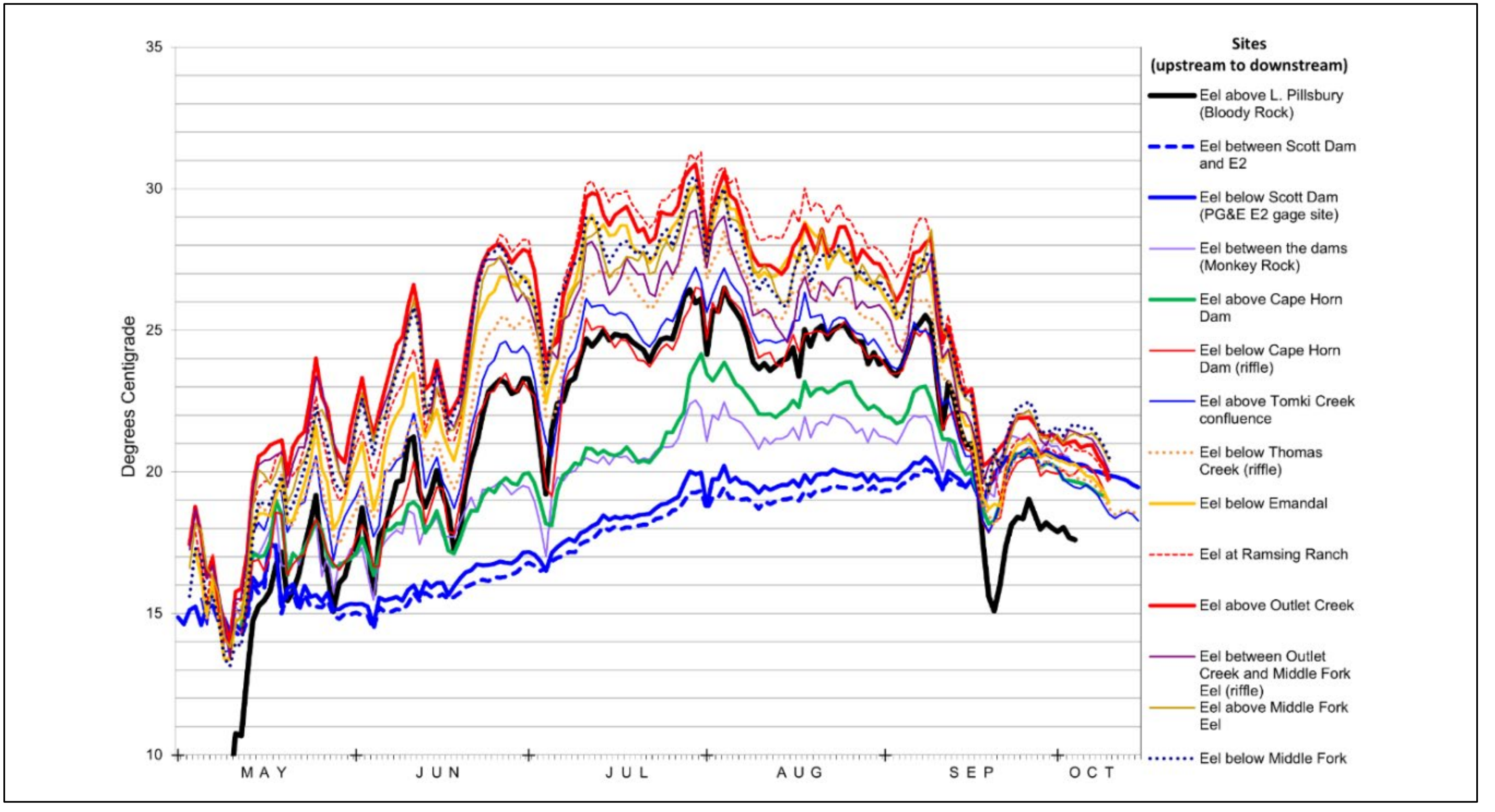


Figure 52. Maximum Daily Water Temperatures at Selected Eel River Sites in 2022

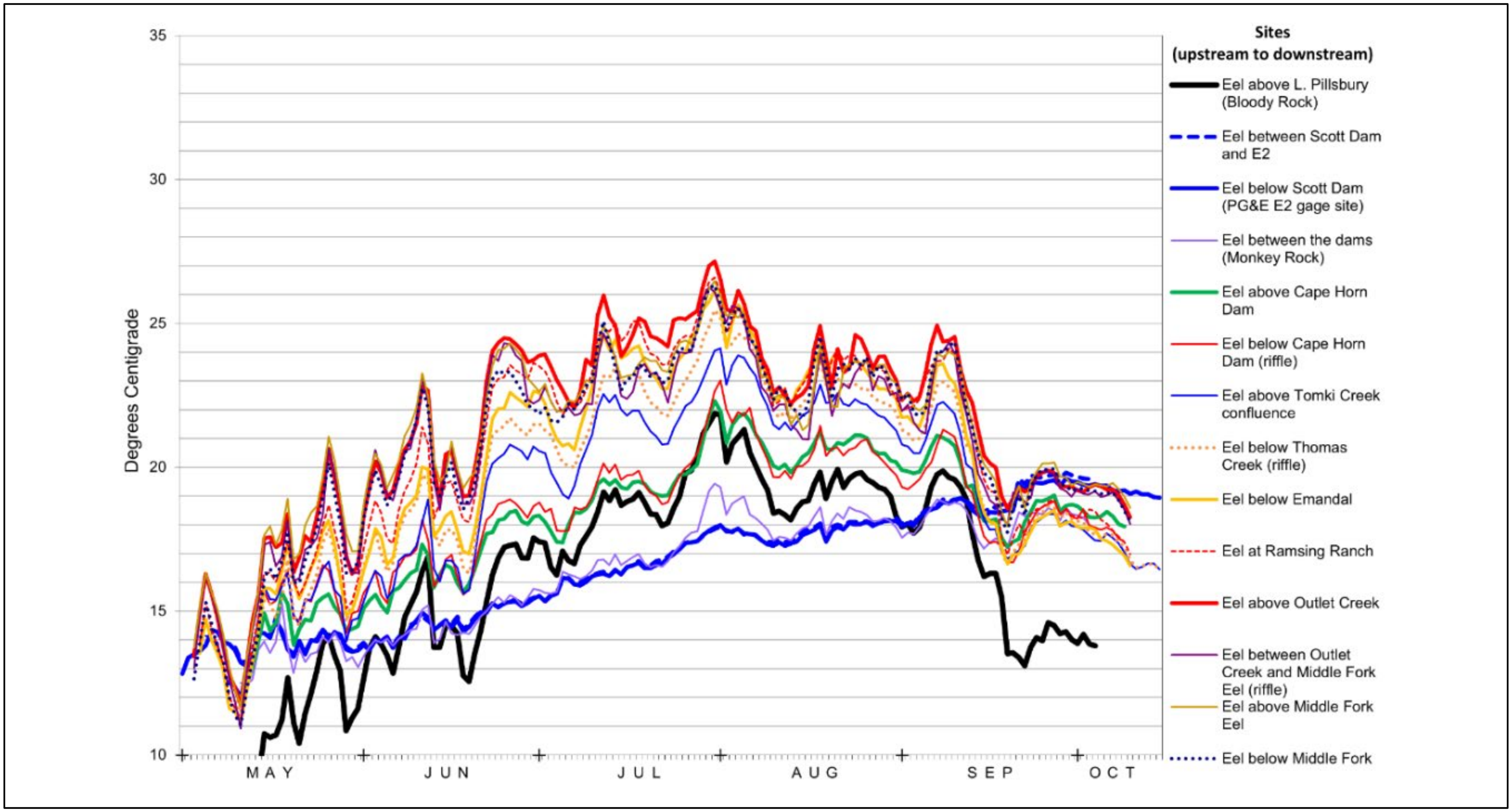


Figure 53. Minimum Daily Water Temperatures at Selected Eel River Sites in 2022

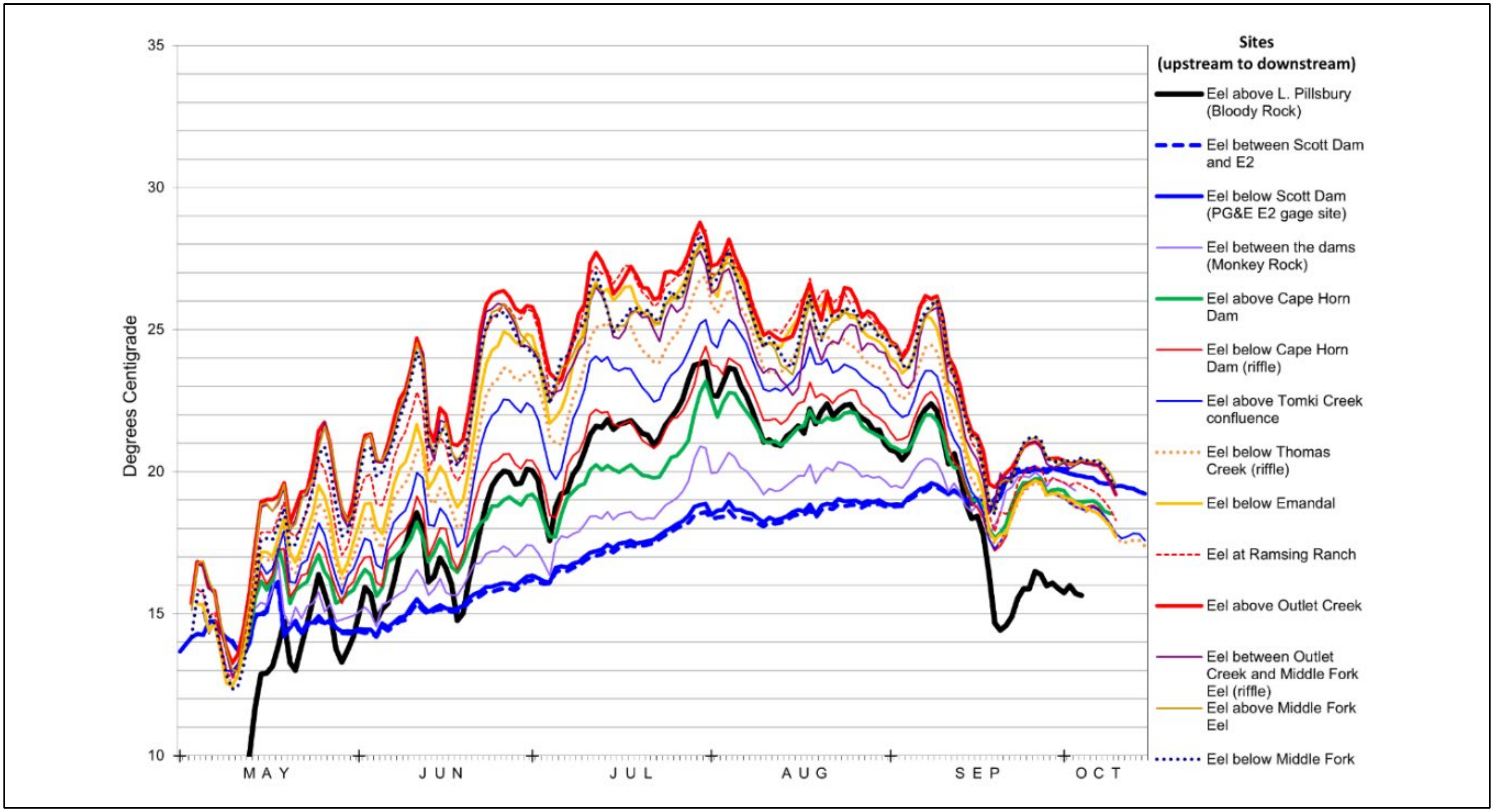


Figure 54. Mean Daily Water Temperatures at Selected Eel River Sites in 2022

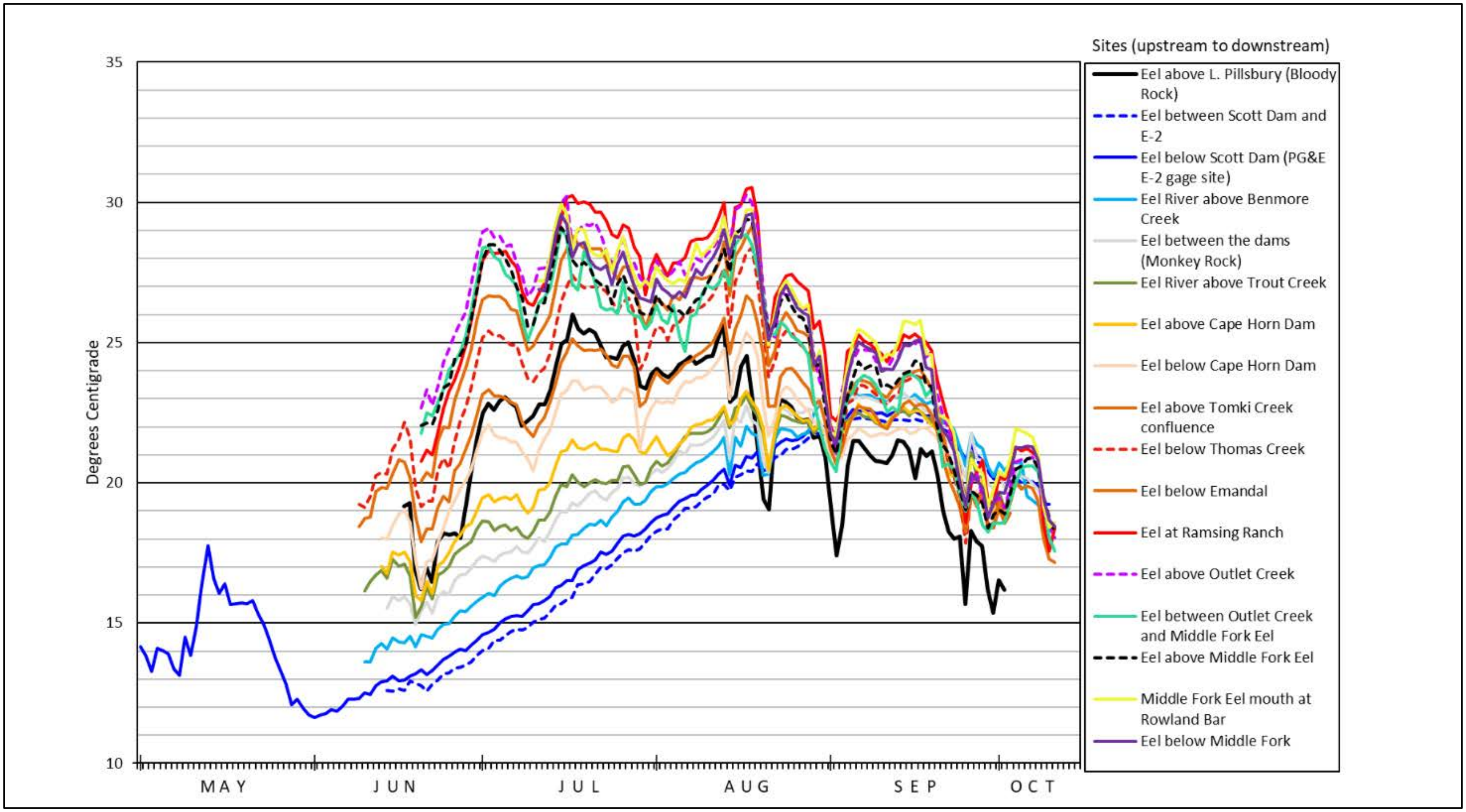


Figure 55. Maximum Daily Water Temperatures at Selected Eel River Sites in 2023

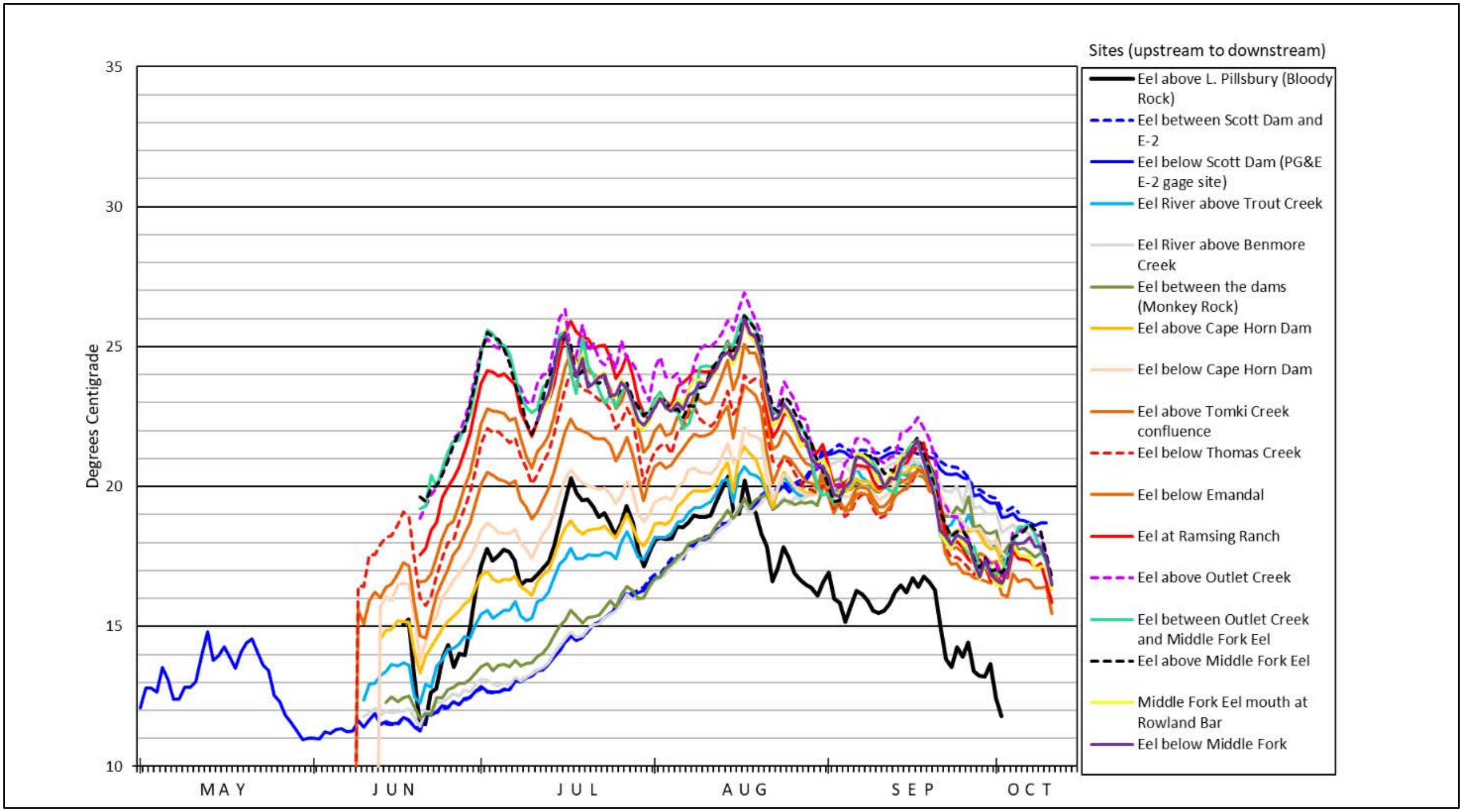


Figure 56. Minimum Daily Water Temperatures at Selected Eel River Sites in 2023

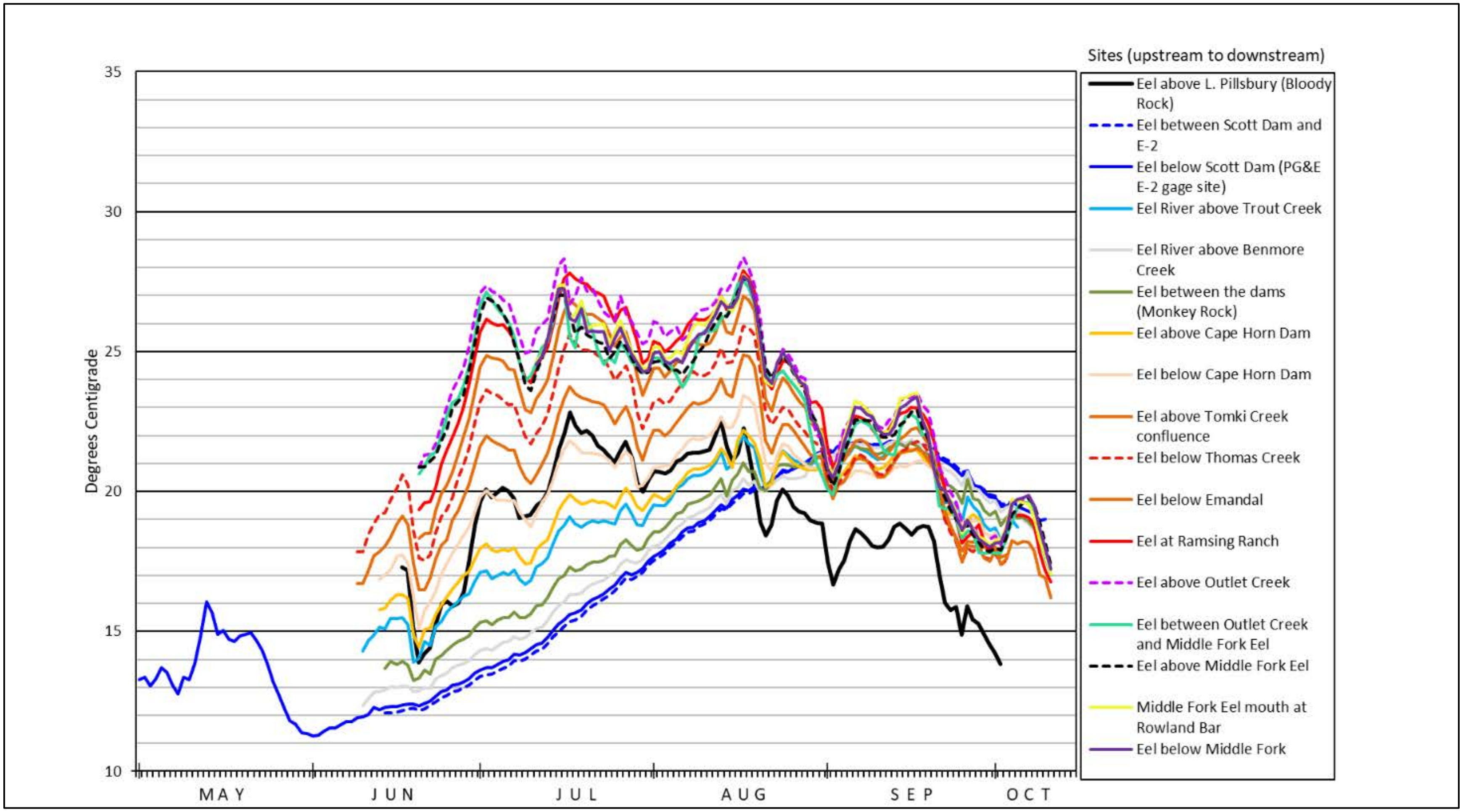


Figure 57. Mean Daily Water Temperatures at Selected Eel River Sites in 2023

This Page Intentionally Left Blank

Appendix 3.3.2-B

Daily Maximum, Mean, and Minimum Water Temperatures at Selected Depths in Lake Pillsbury near Face of Scott Dam (April through October, 2014–2015, 2017–2023)

This Page Intentionally Left Blank

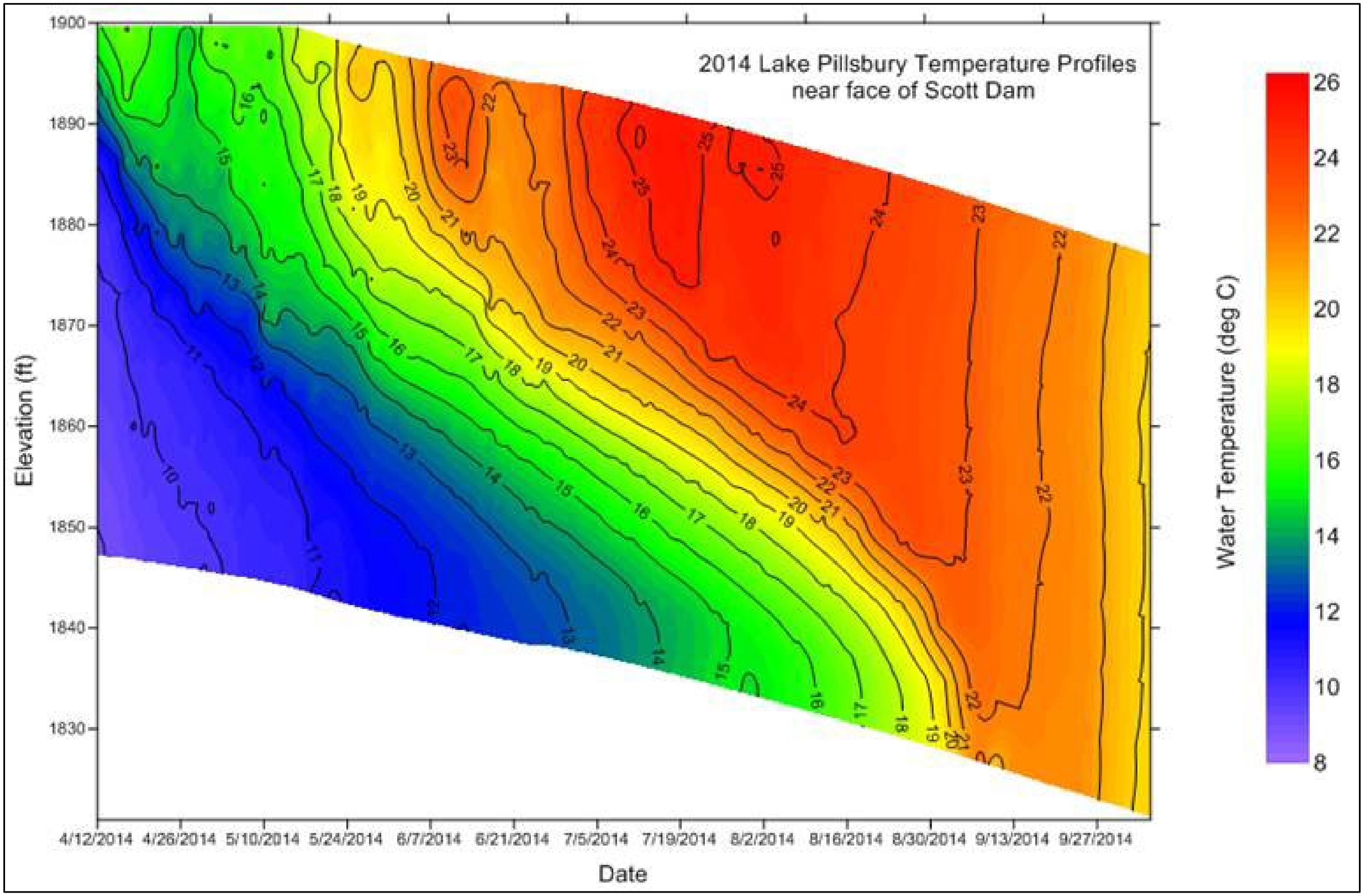


Figure 1. Lake Pillsbury Water Temperatures Isopleths near face of Scott Dam for 2014

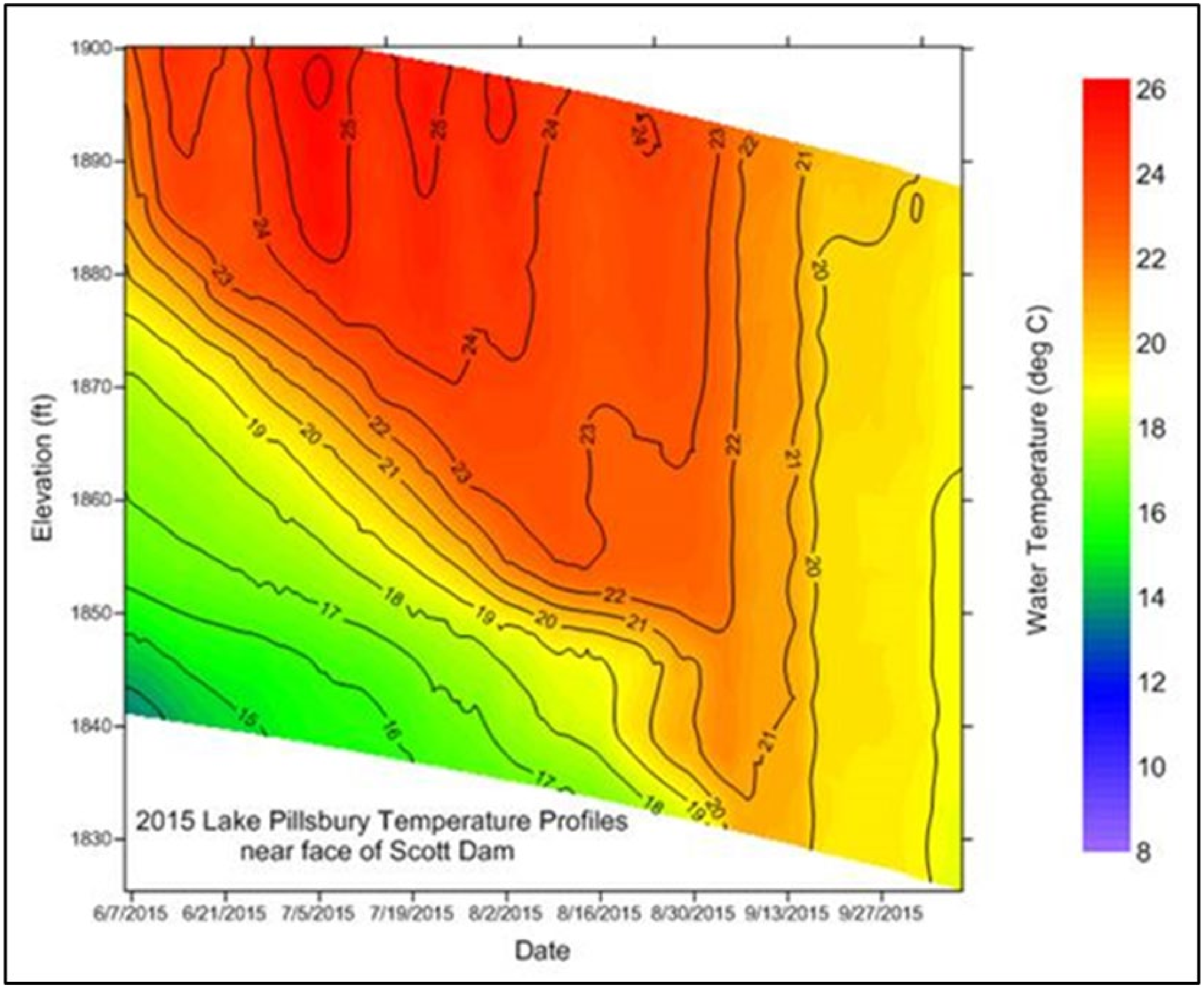


Figure 2. Lake Pillsbury Water Temperatures Isopleths near face of Scott Dam for 2015

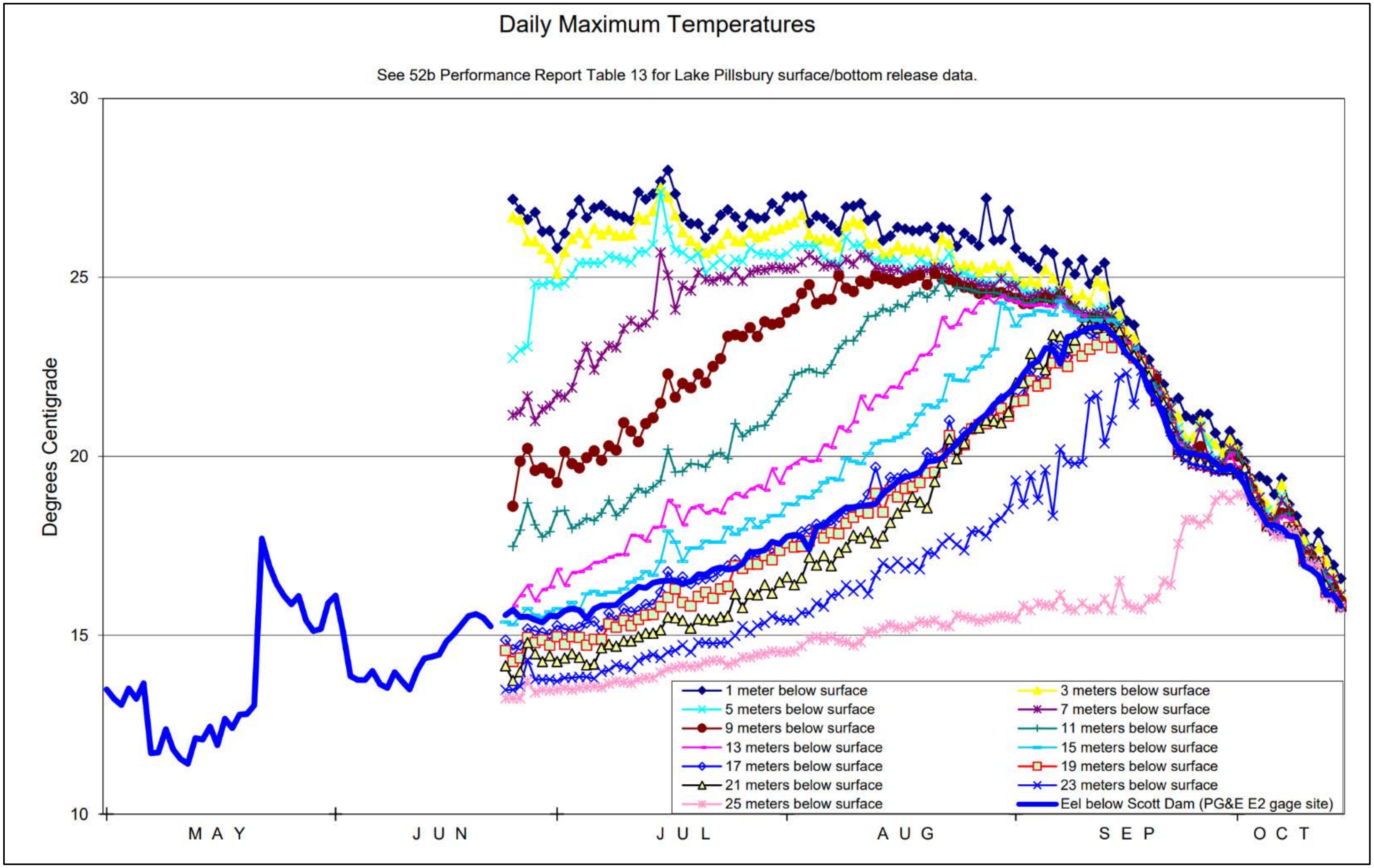


Figure 3. Maximum Daily Water Temperatures near face of Scott Dam for 2017

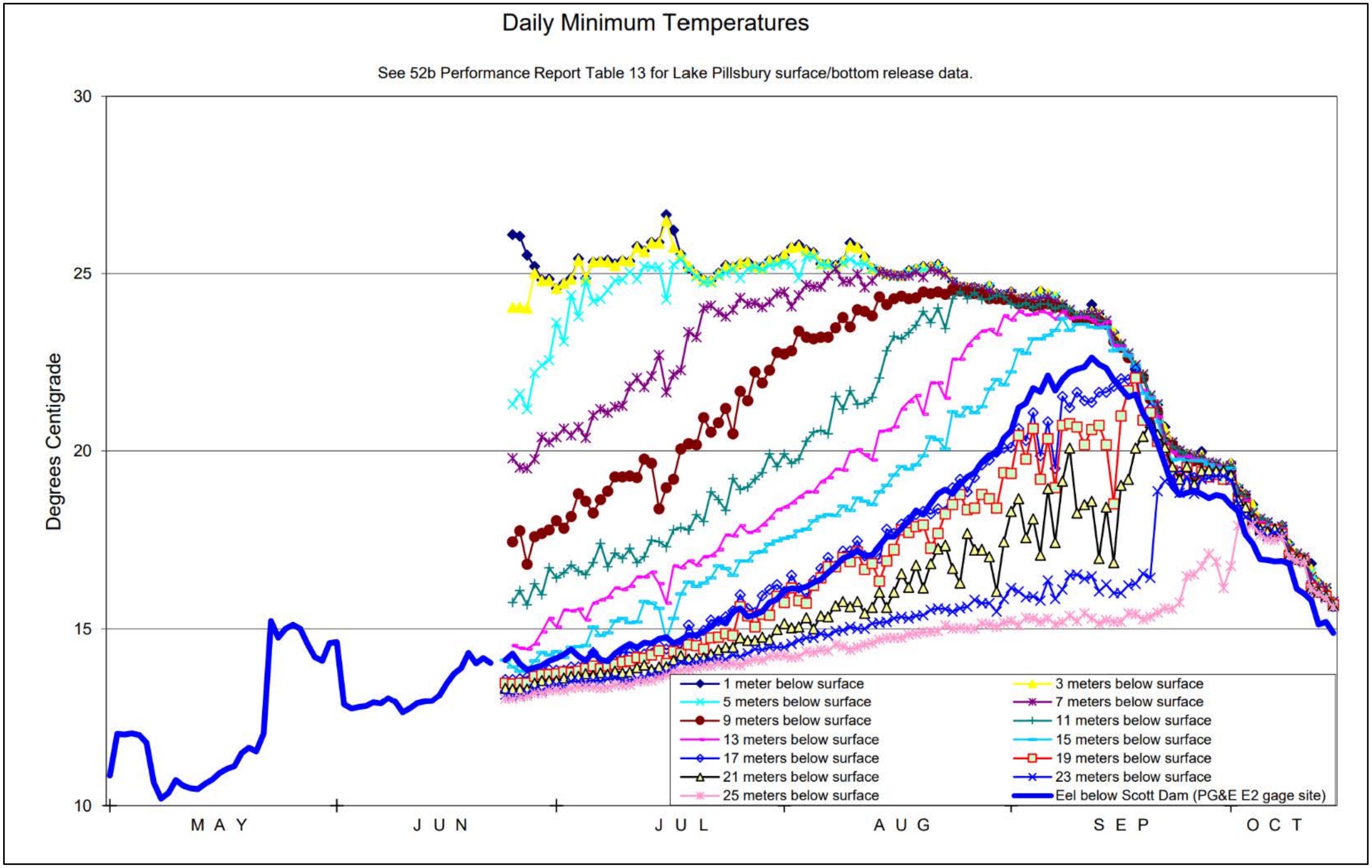


Figure 4. Minimum Daily Water Temperatures near face of Scott Dam for 2017

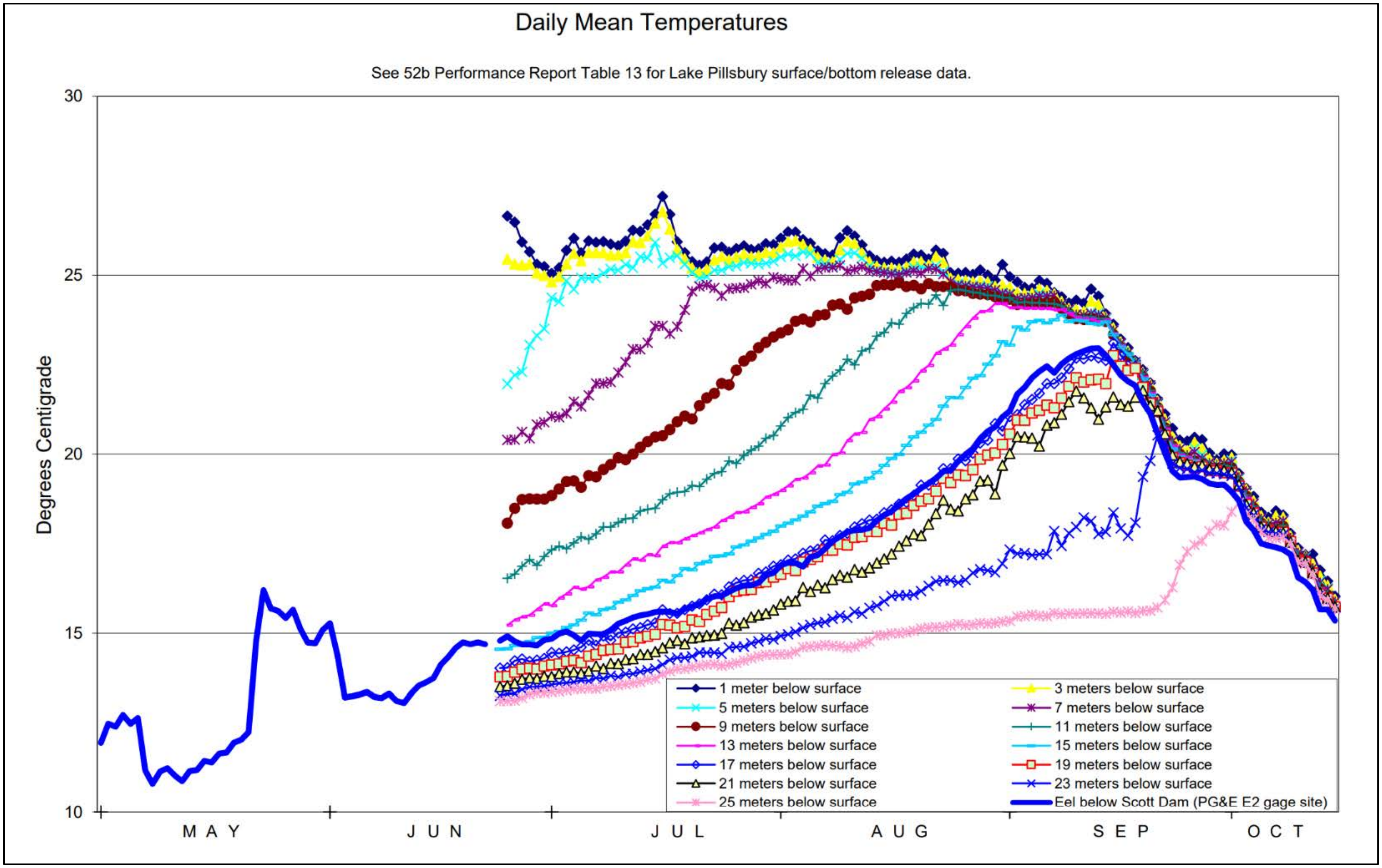


Figure 5. Mean Daily Water Temperatures near face of Scott Dam for 2017

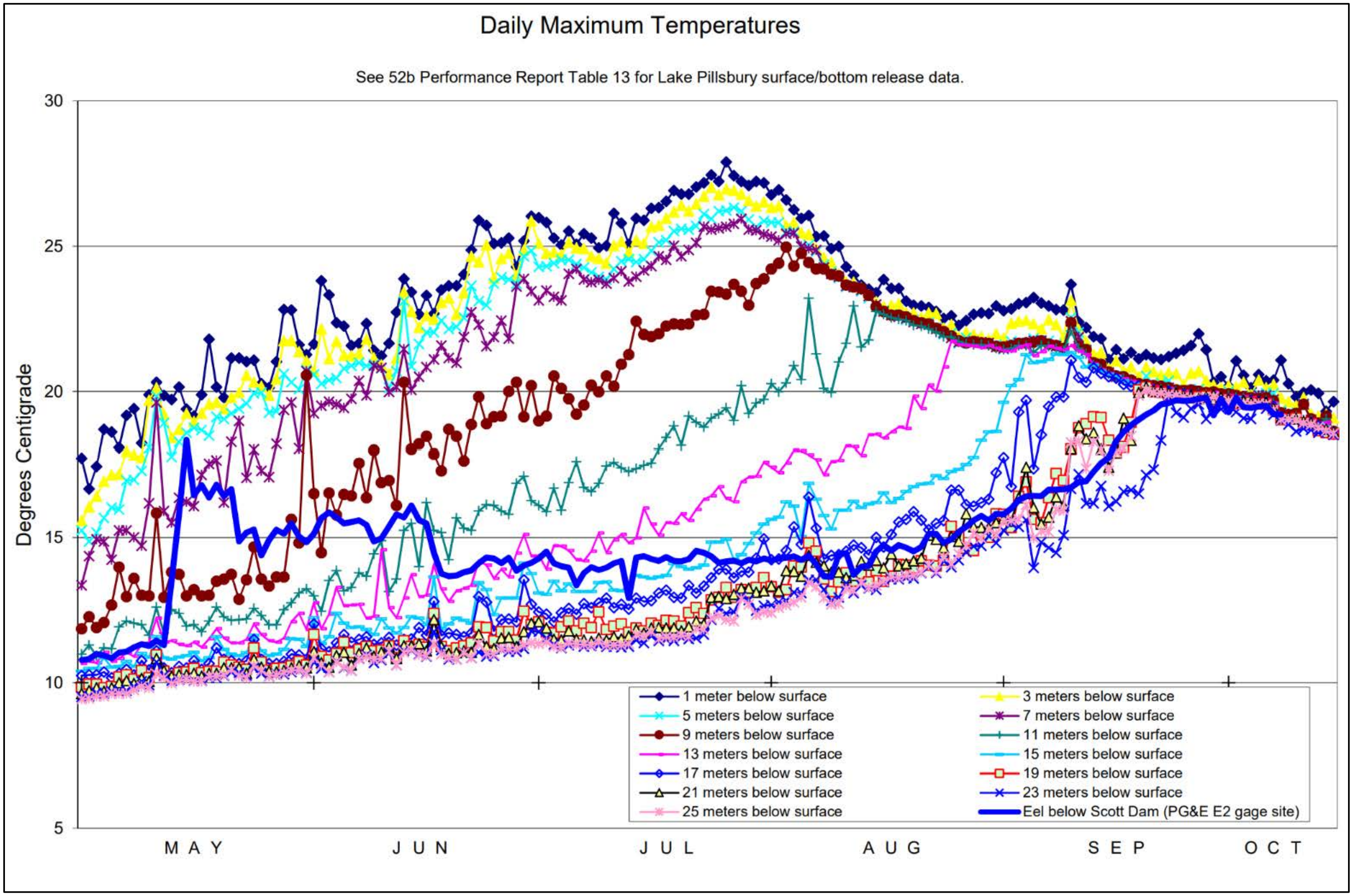


Figure 6. Maximum Daily Water Temperatures near face of Scott Dam for 2018

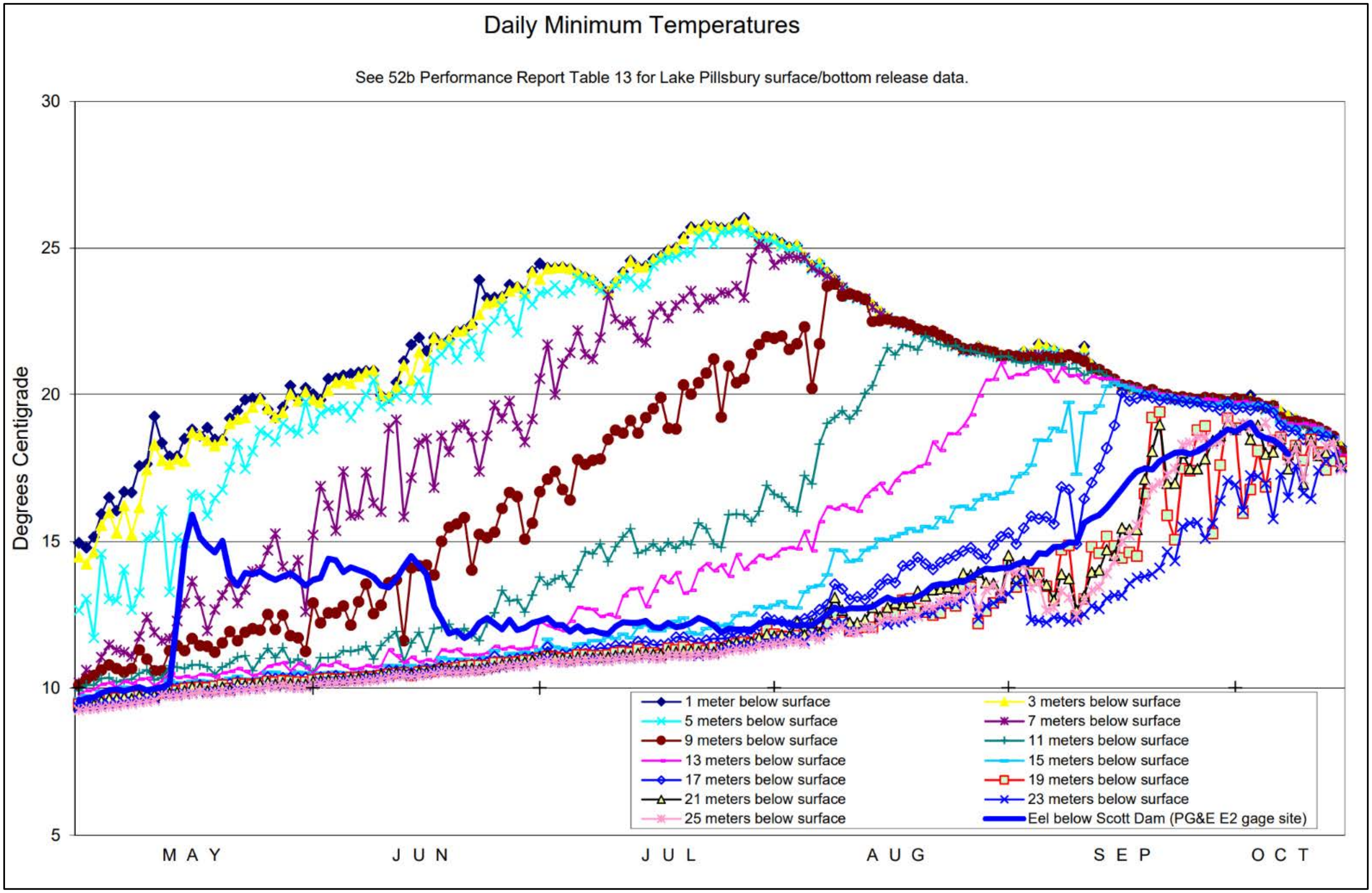


Figure 7. Minimum Daily Water Temperatures near face of Scott Dam for 2018

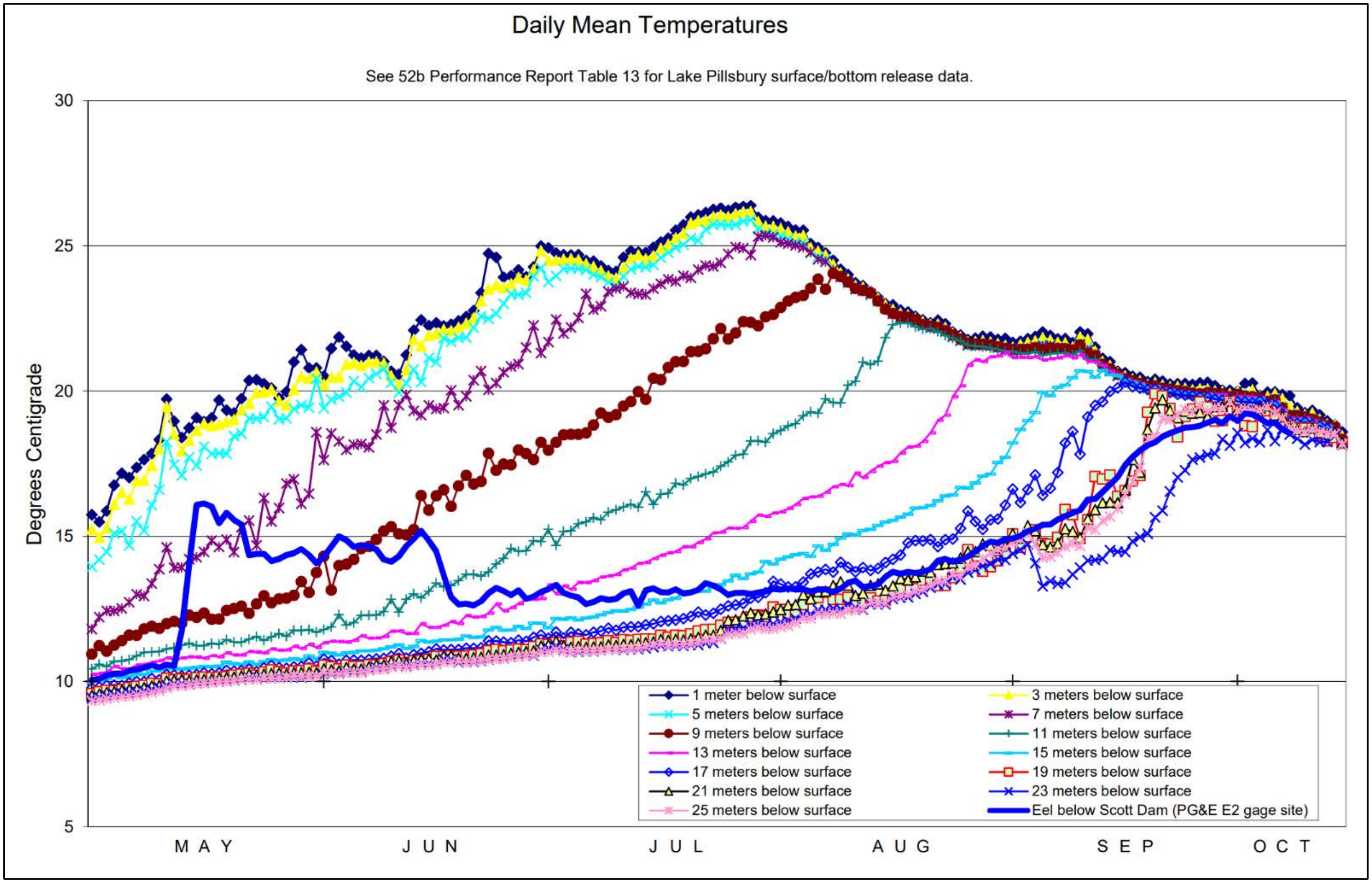


Figure 8. Mean Daily Water Temperatures near face of Scott Dam for 2018

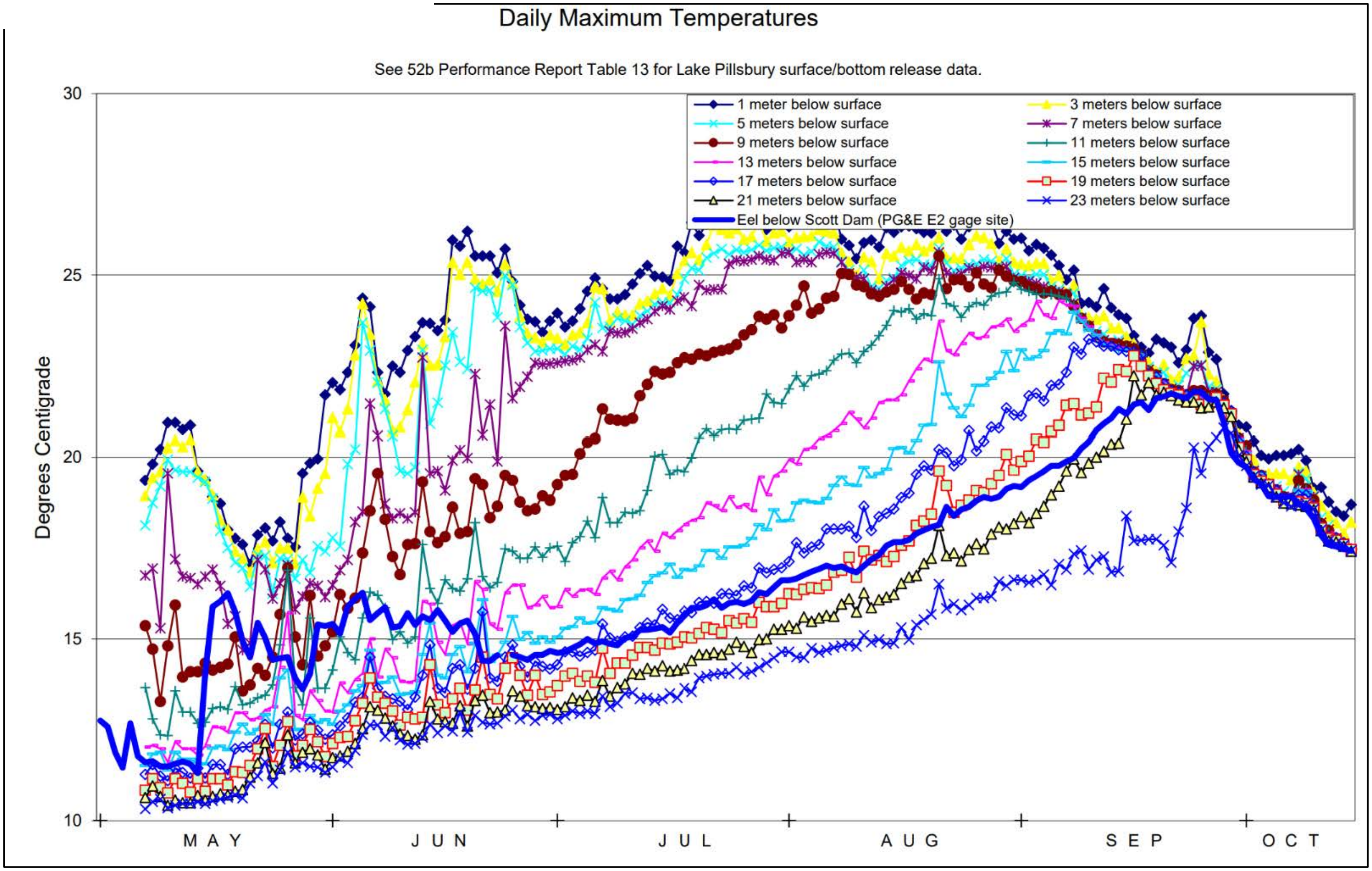


Figure 9. Maximum Daily Water Temperatures near face of Scott Dam for 2019

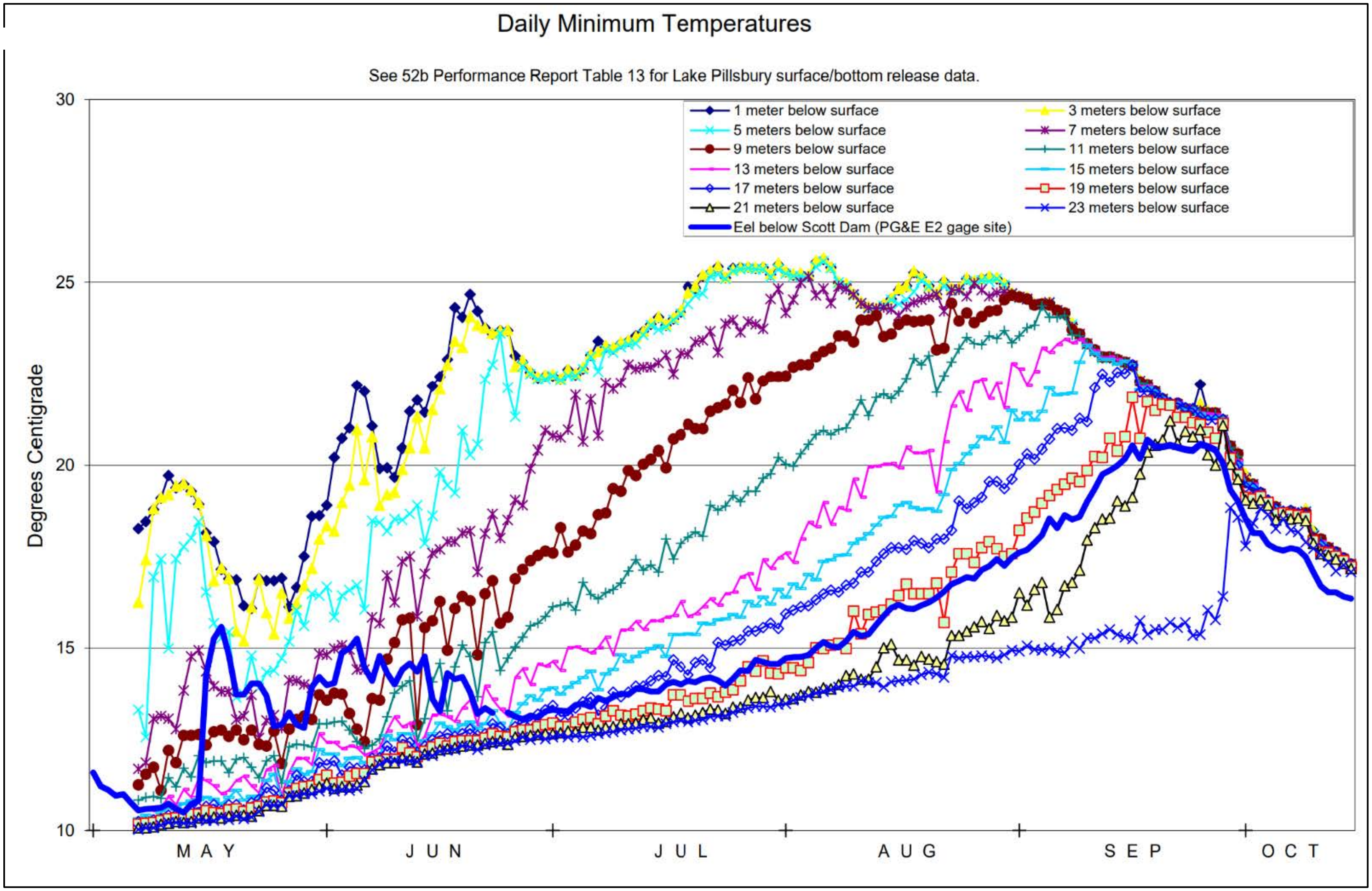


Figure 10. Minimum Daily Water Temperatures near face of Scott Dam for 2019

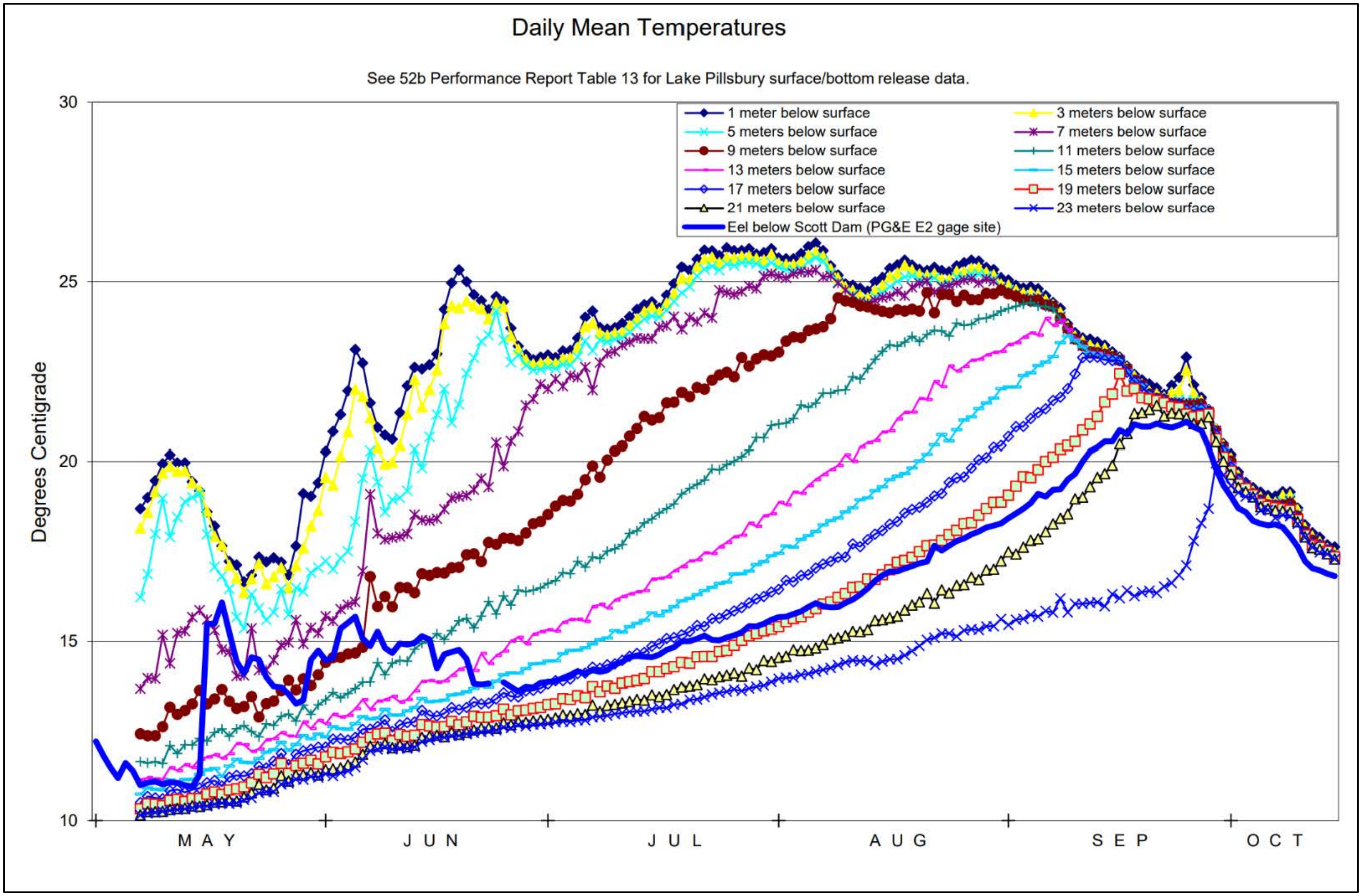


Figure 11. Mean Daily Water Temperatures near face of Scott Dam for 2019

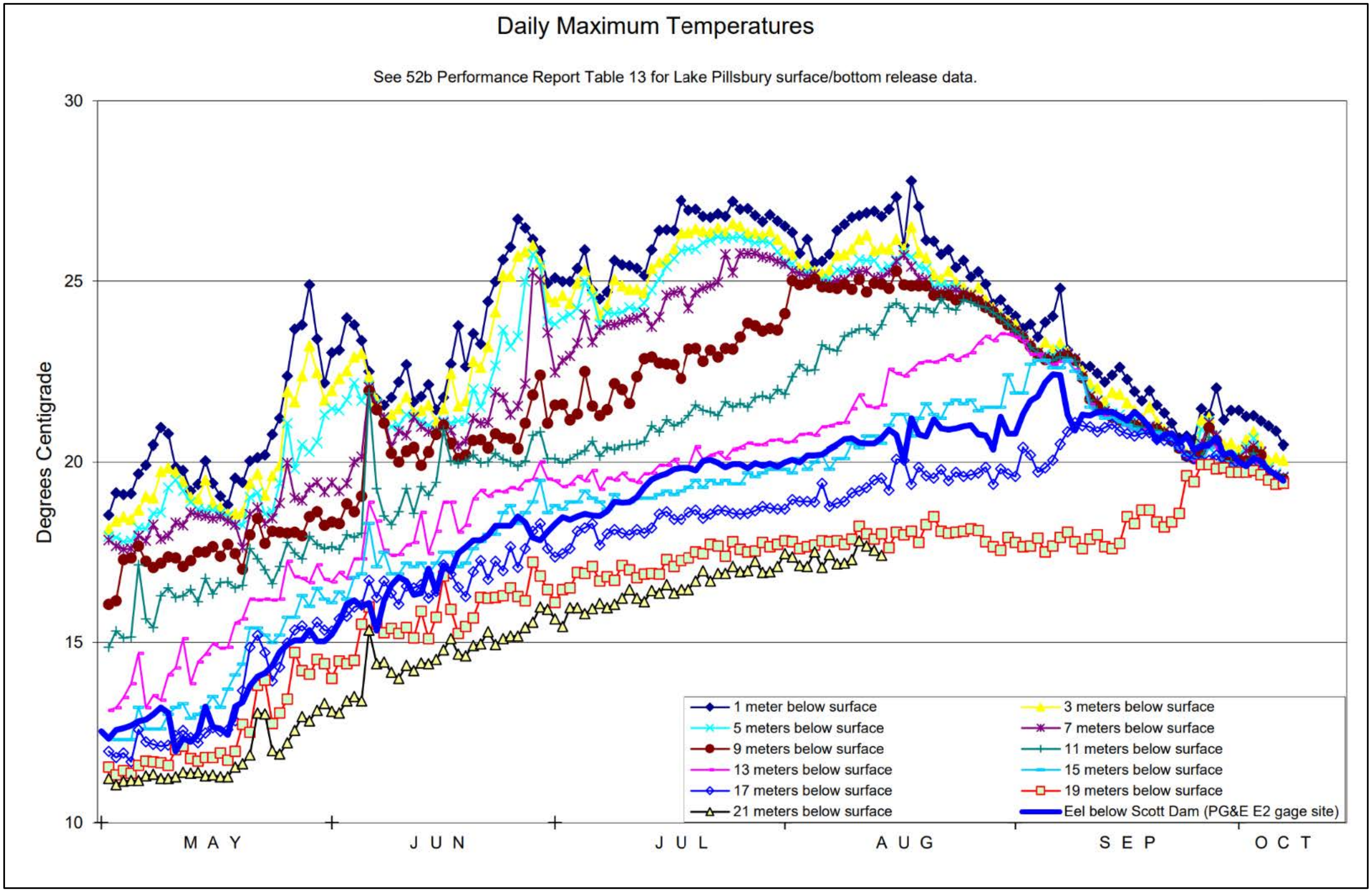


Figure 12. Maximum Daily Water Temperatures near face of Scott Dam for 2020

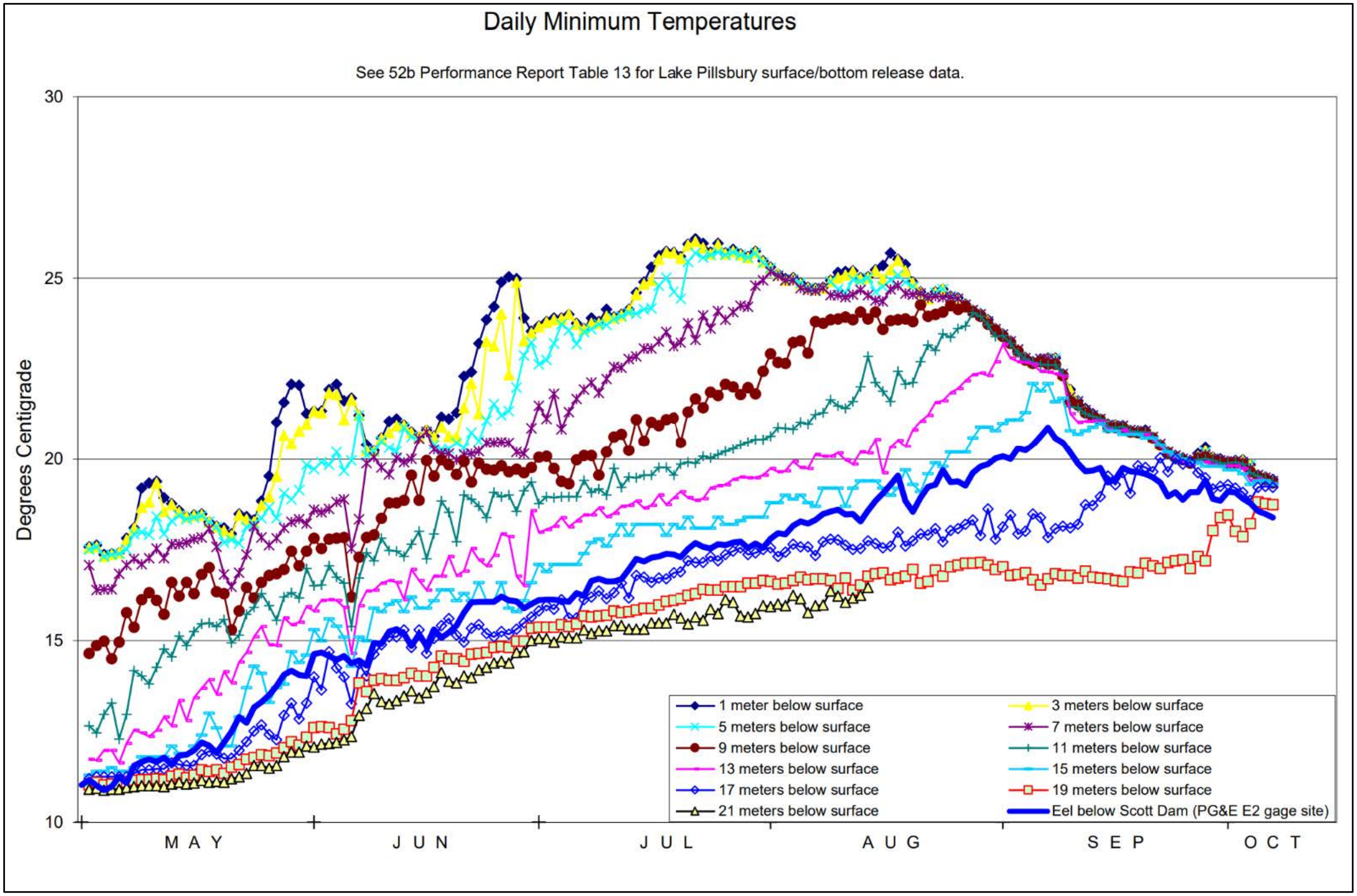


Figure 13. Minimum Daily Water Temperatures near face of Scott Dam for 2020

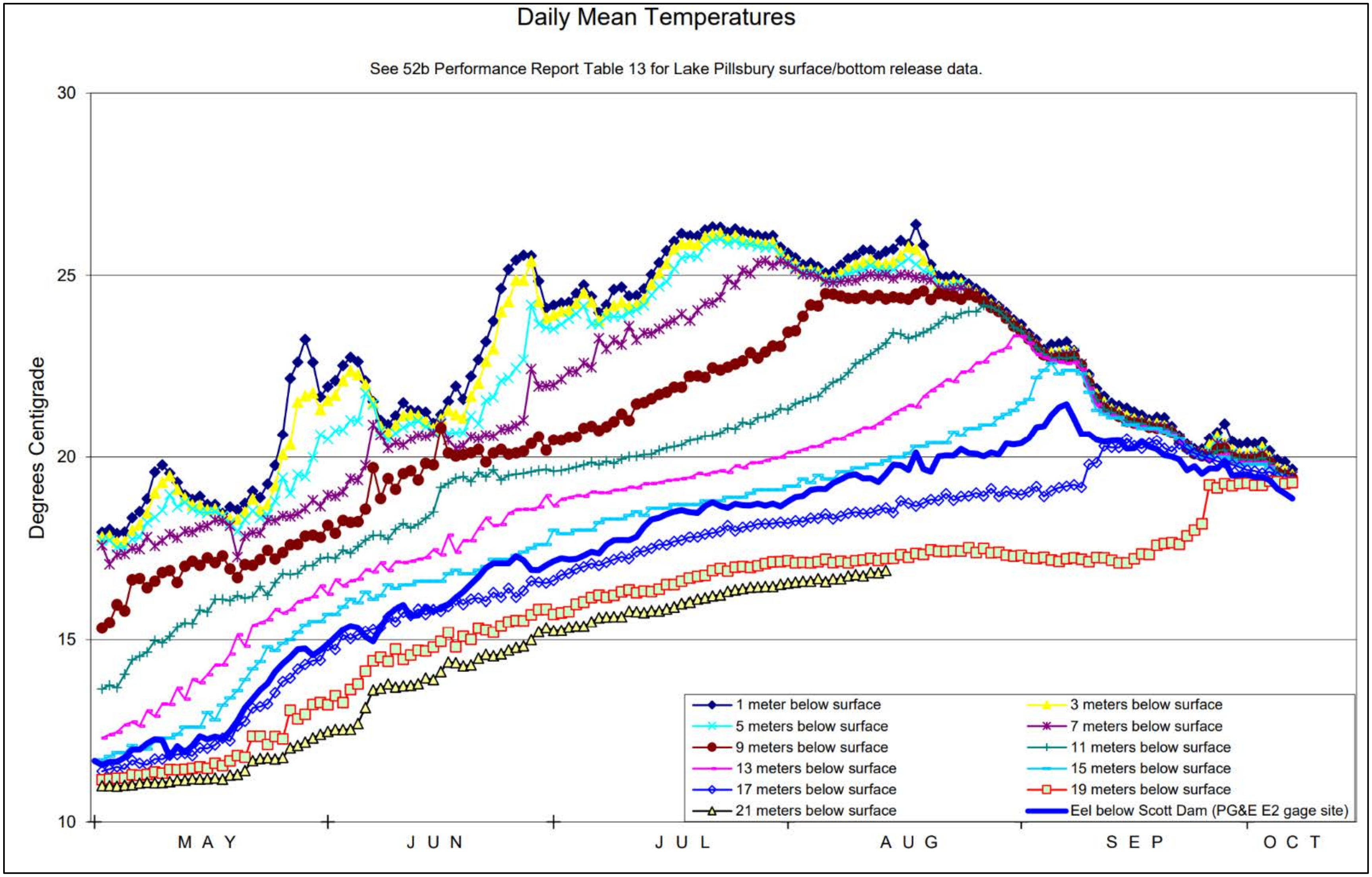


Figure 14. Mean Daily Water Temperatures near face of Scott Dam for 2020

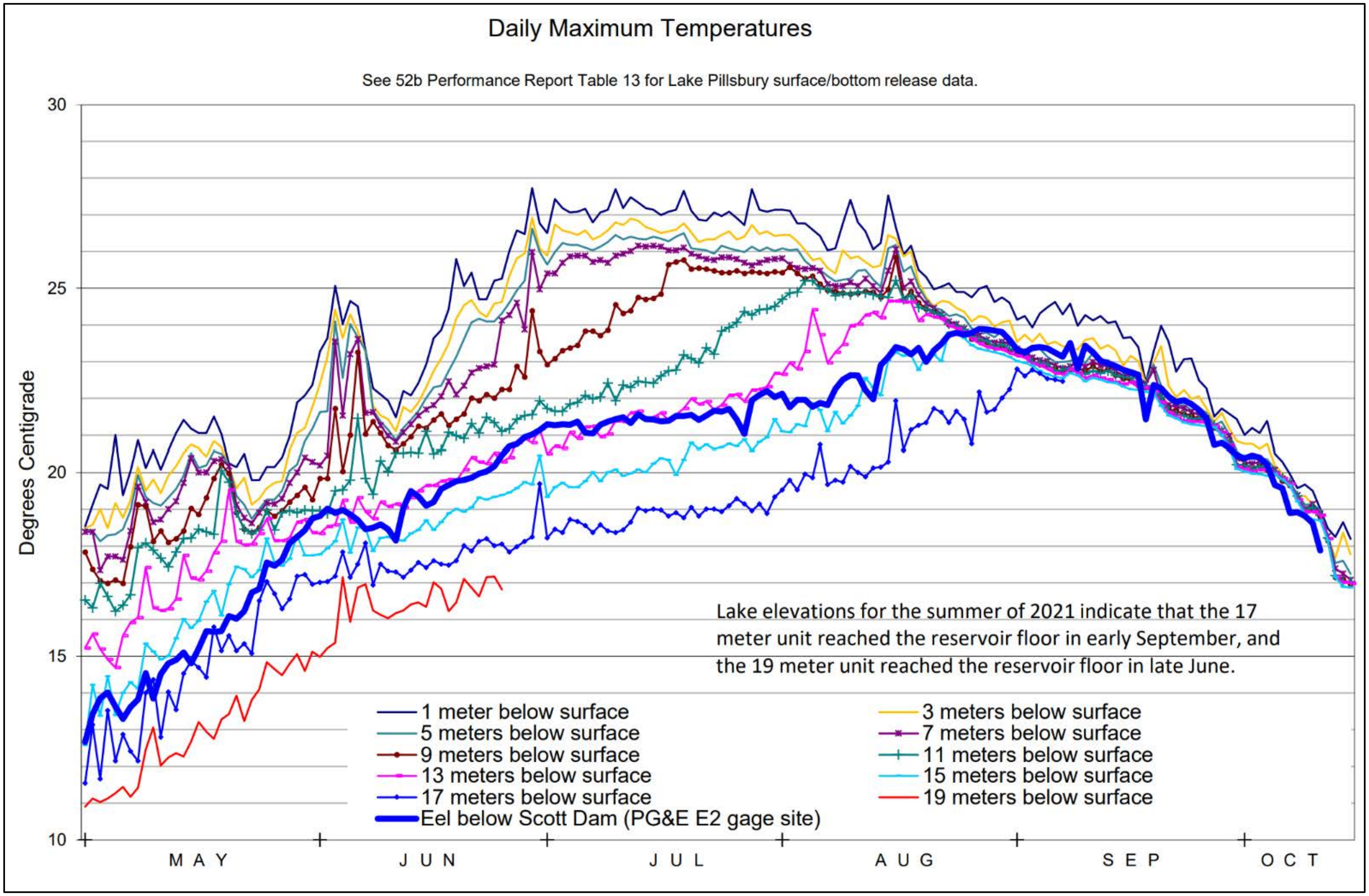


Figure 15. Maximum Daily Water Temperatures near face of Scott Dam for 2021

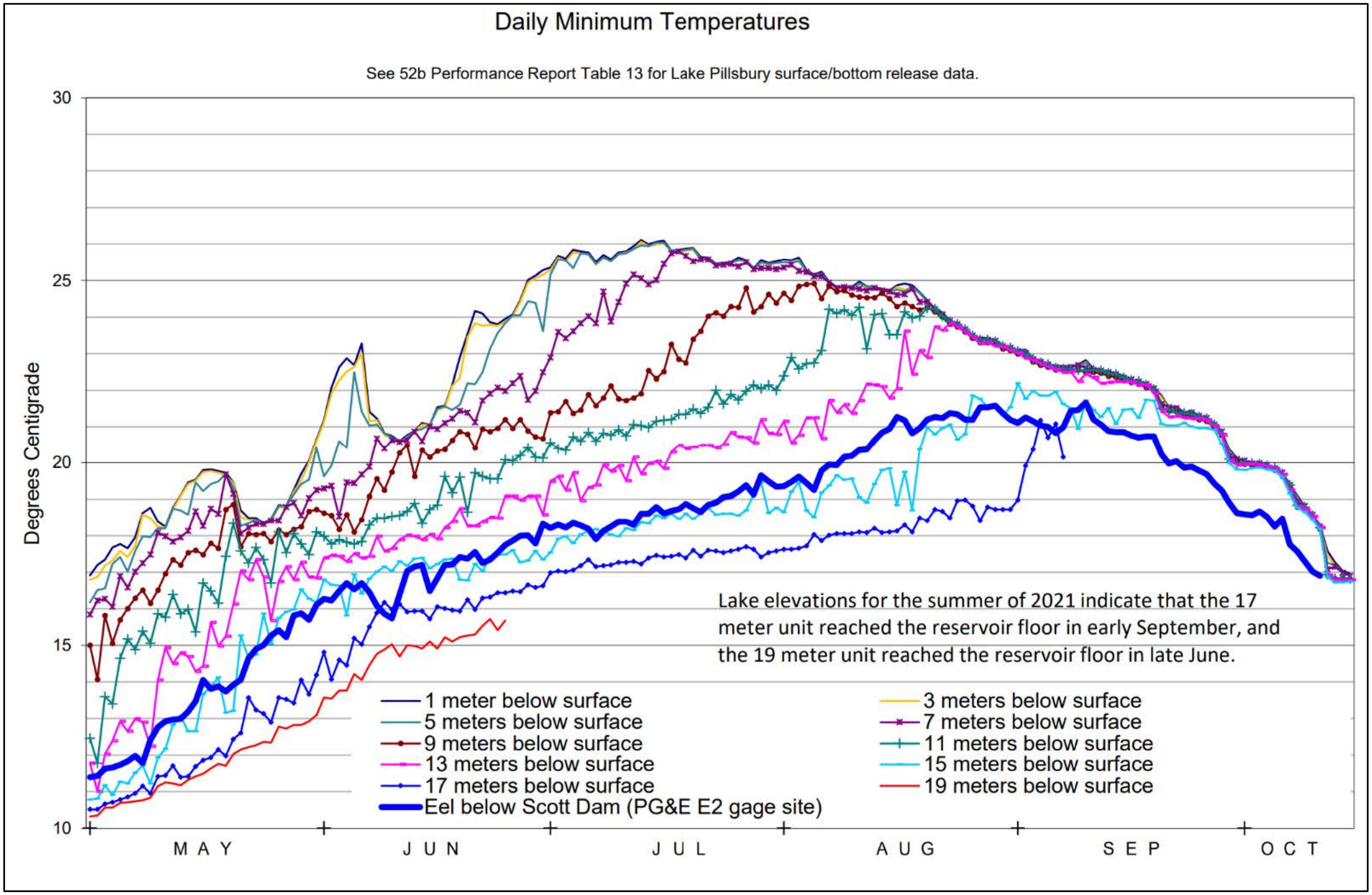


Figure 16. Minimum Daily Water Temperatures near face of Scott Dam for 2021

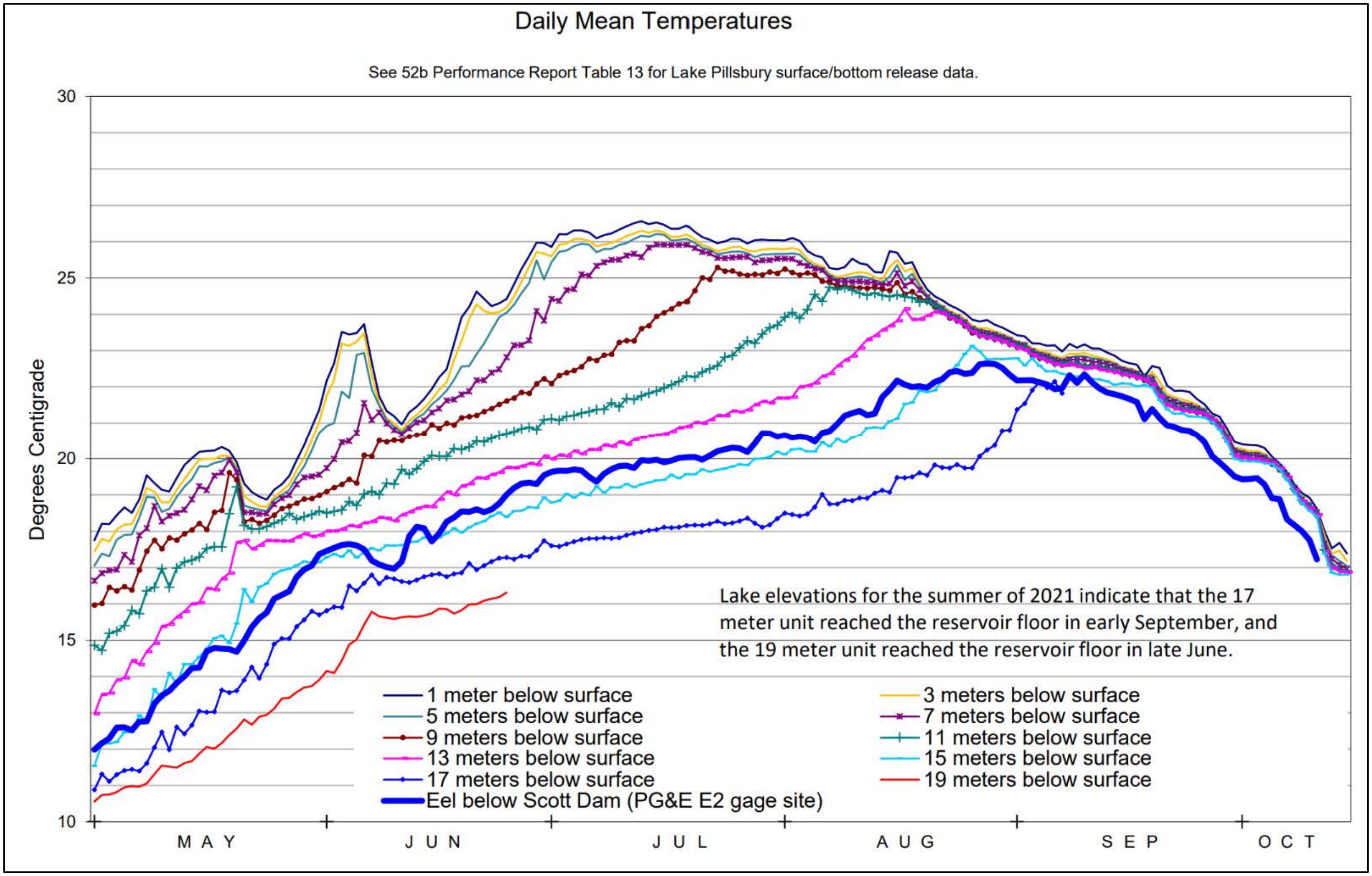


Figure 17. Mean Daily Water Temperatures near face of Scott Dam for 2021

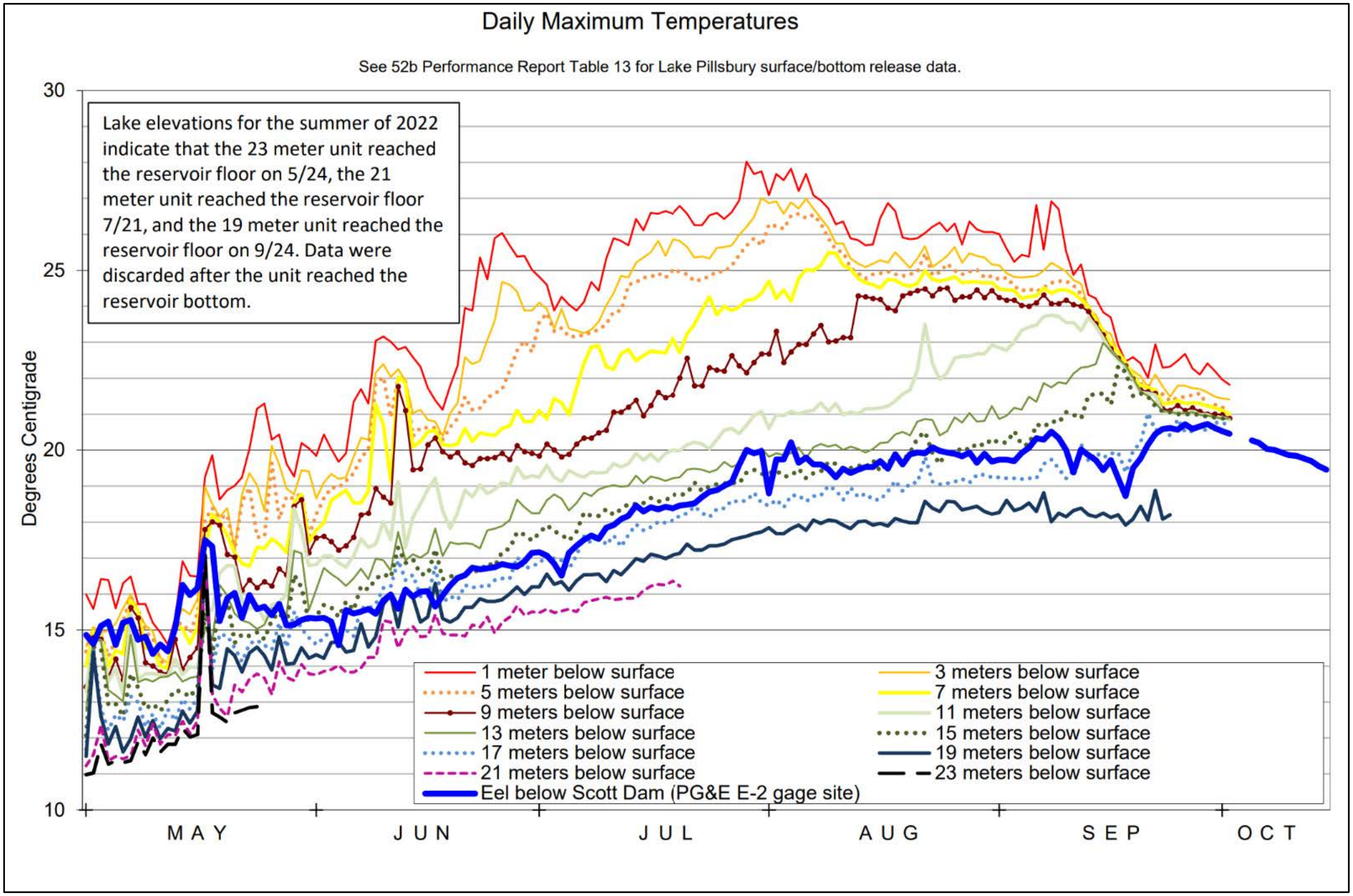


Figure 18. Maximum Daily Water Temperatures near face of Scott Dam for 2022

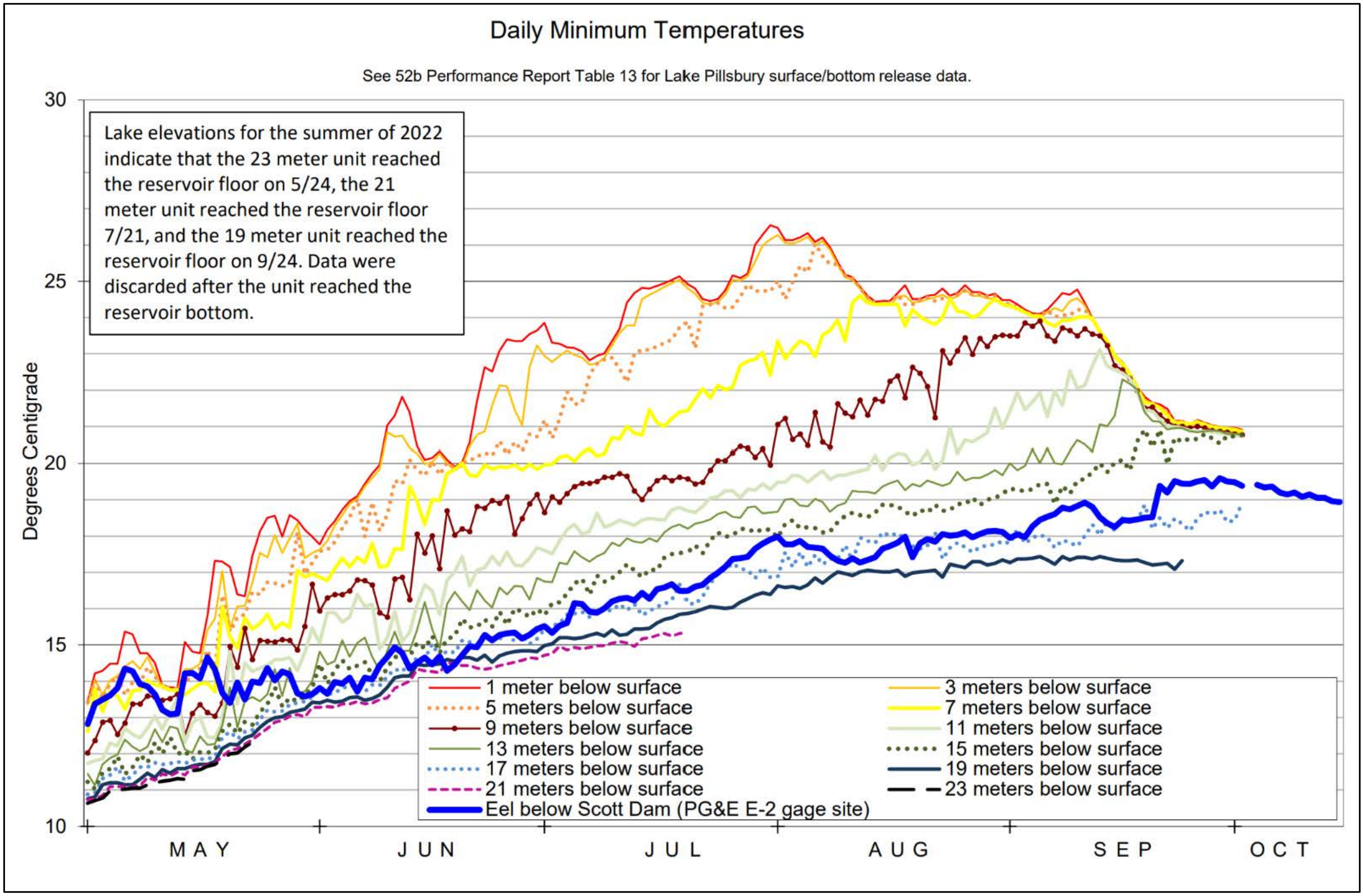


Figure 19. Minimum Daily Water Temperatures near face of Scott Dam for 2022

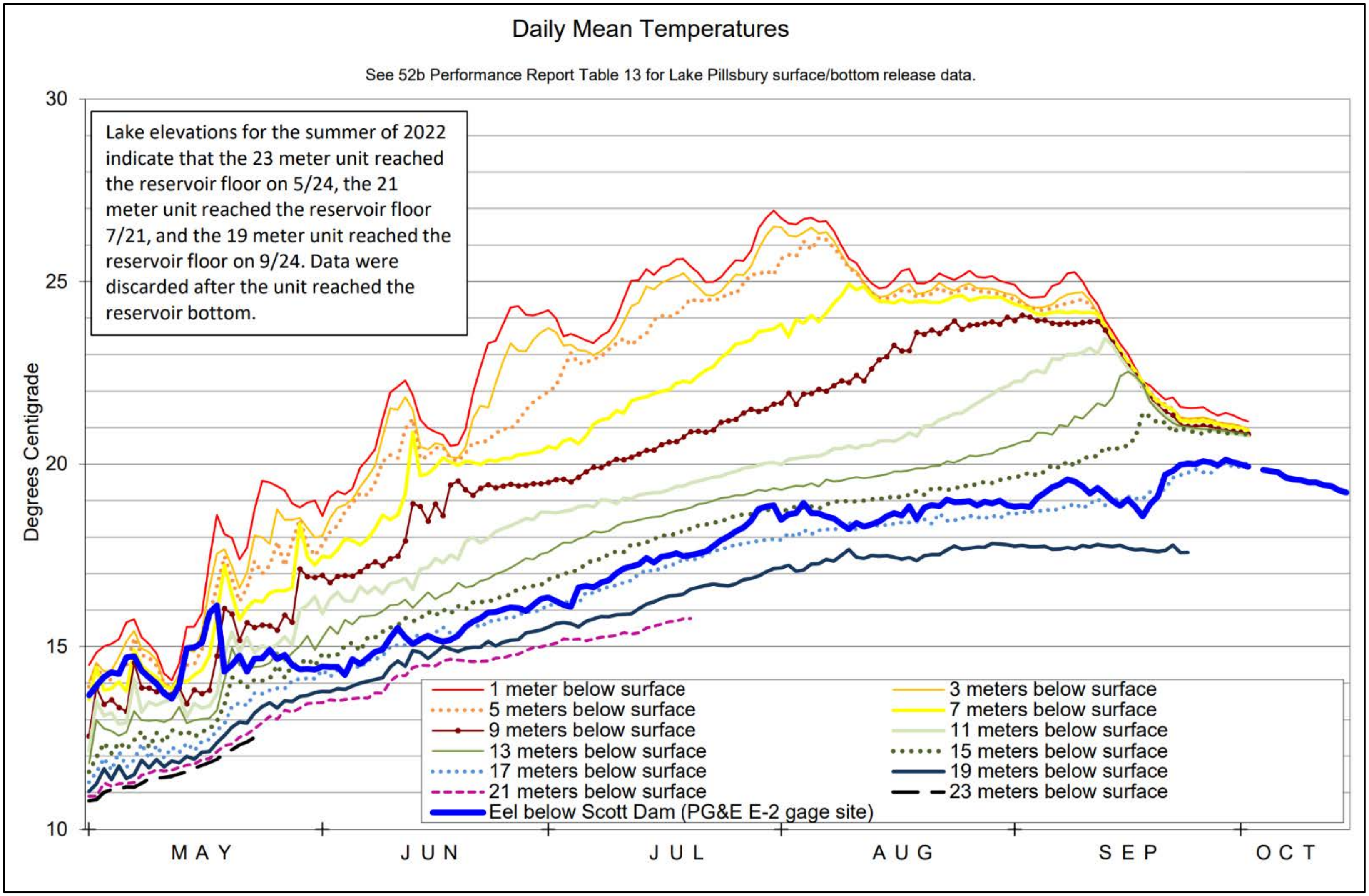


Figure 20. Mean Daily Water Temperatures near face of Scott Dam for 2022

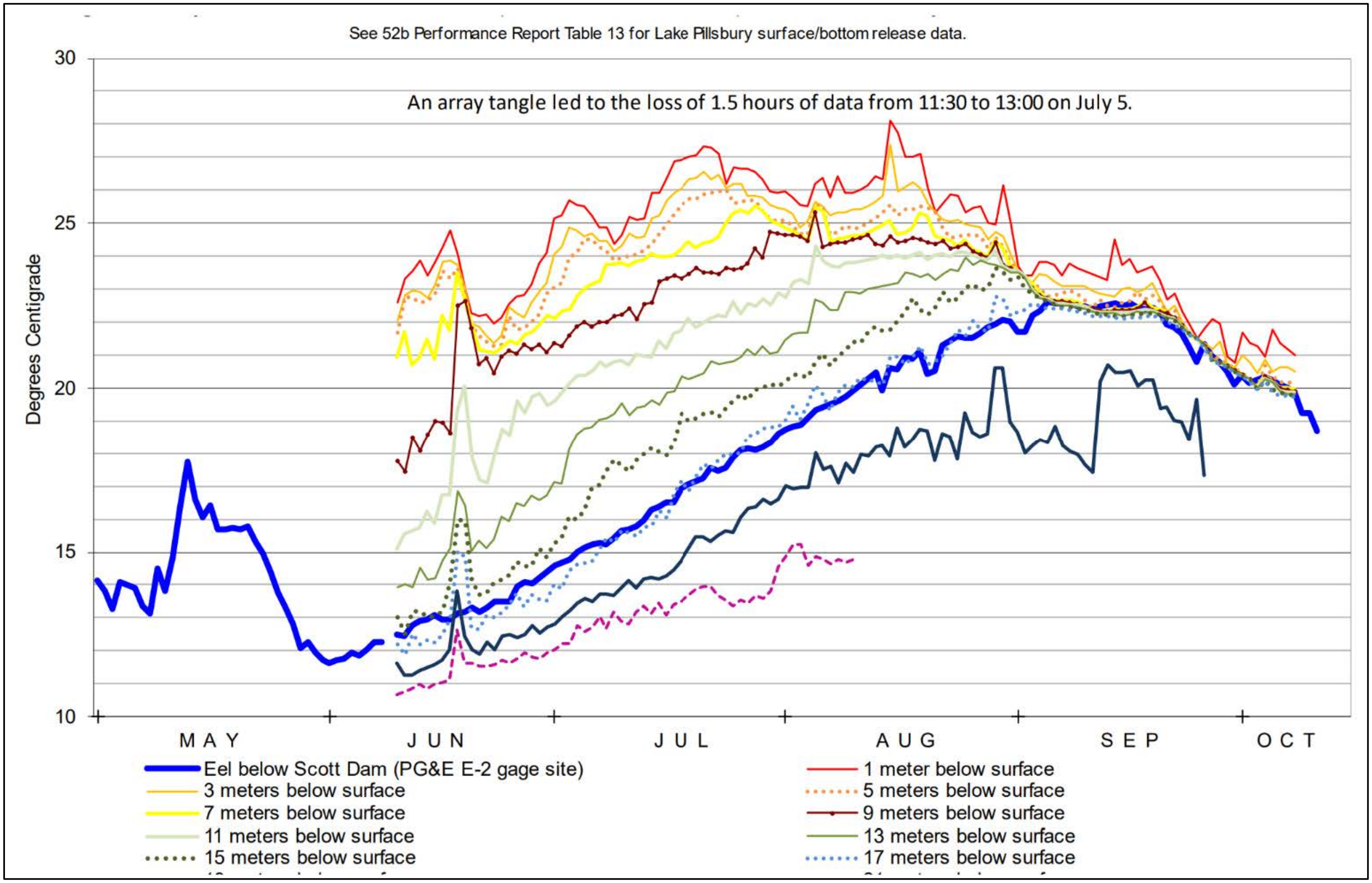


Figure 21. Maximum Daily Water Temperatures near face of Scott Dam for 2023

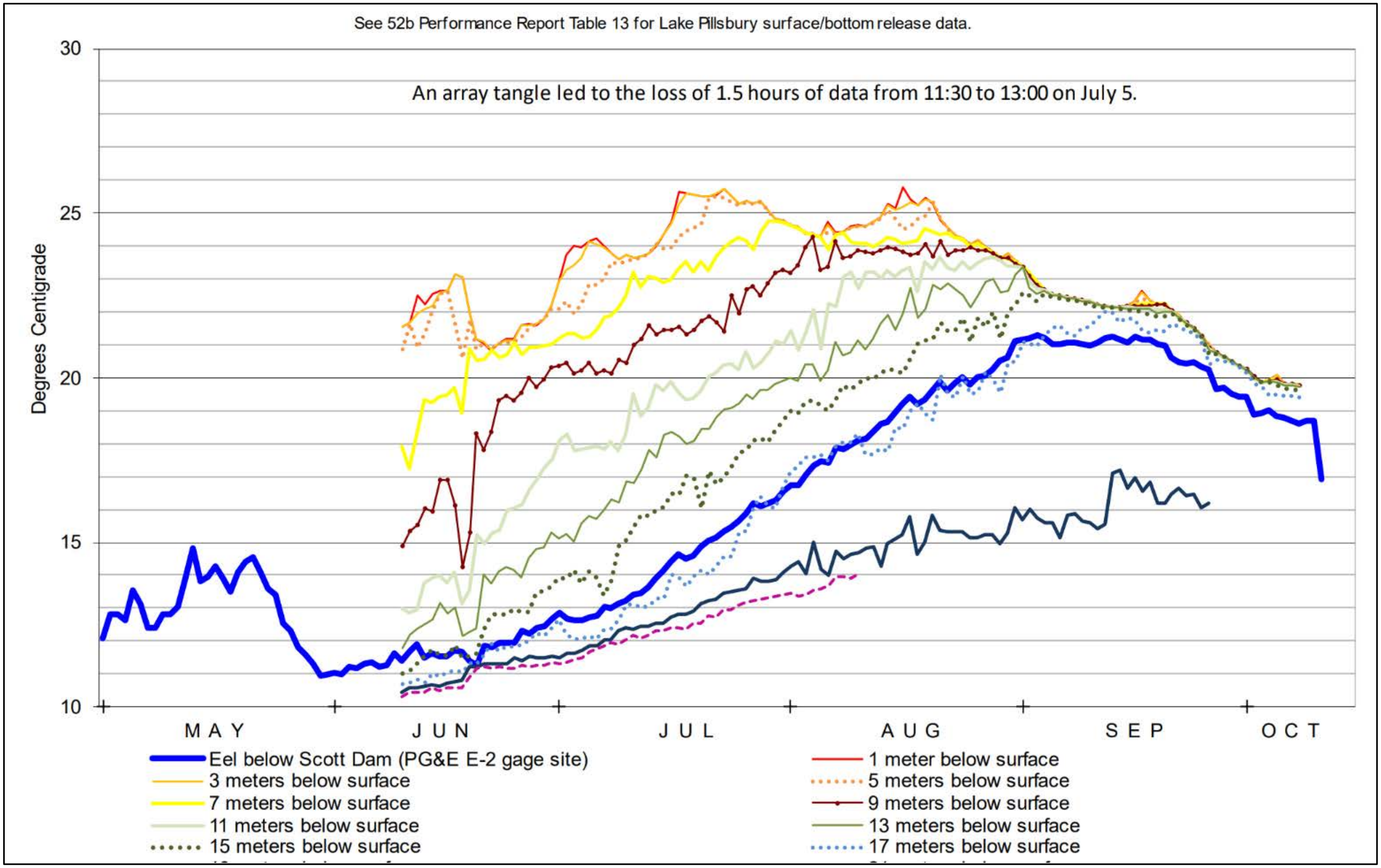


Figure 22. Minimum Daily Water Temperatures near face of Scott Dam for 2023

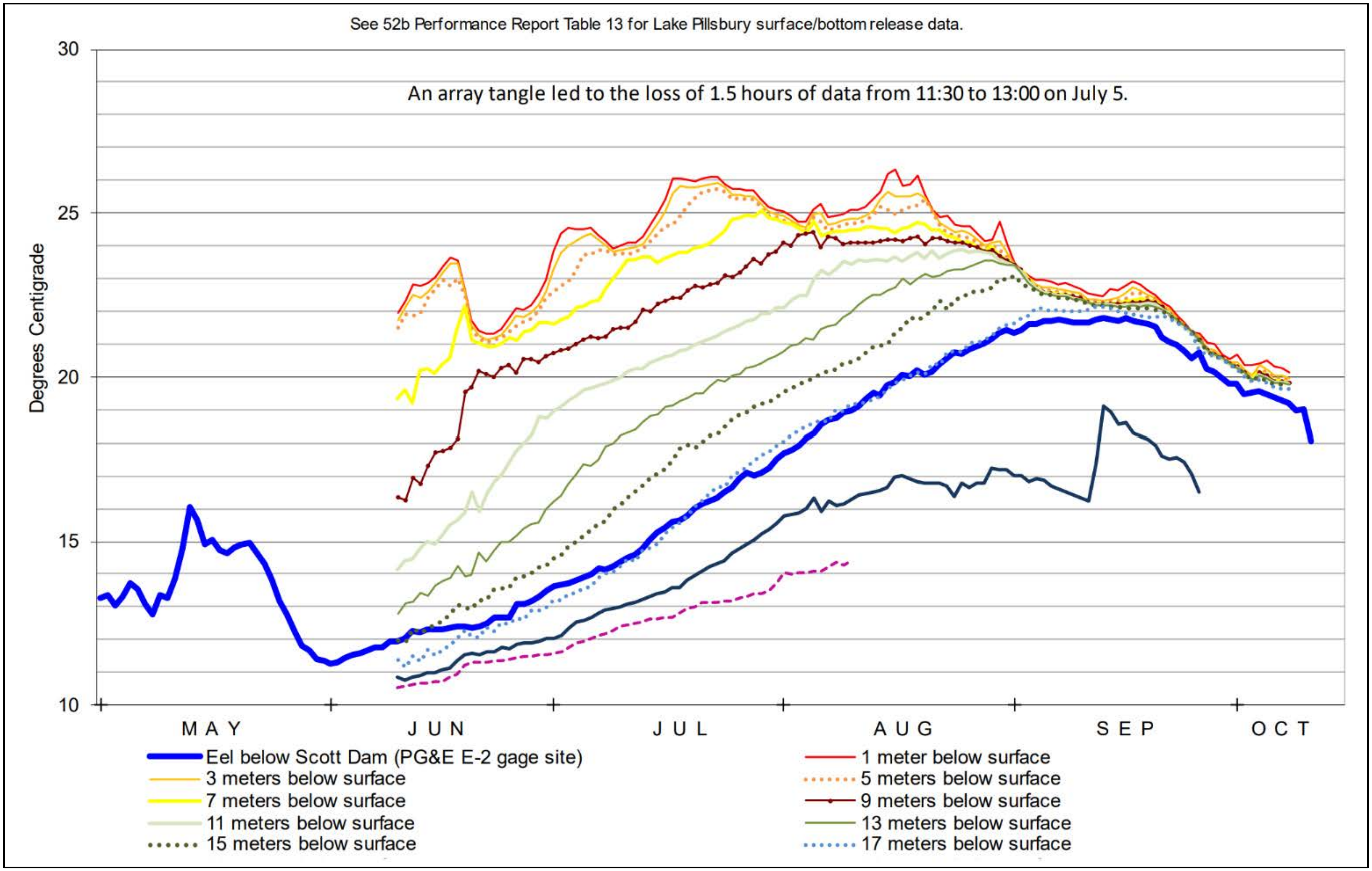


Figure 23. Mean Daily Water Temperatures near face of Scott Dam for 2023

This Page Intentionally Left Blank

Appendix 3.3.2-C

Daily Maximum, Mean, and Minimum Dissolved Oxygen at Selected Depths in Lake Pillsbury near Face of Scott Dam (May through October 2020–2023)

This Page Intentionally Left Blank

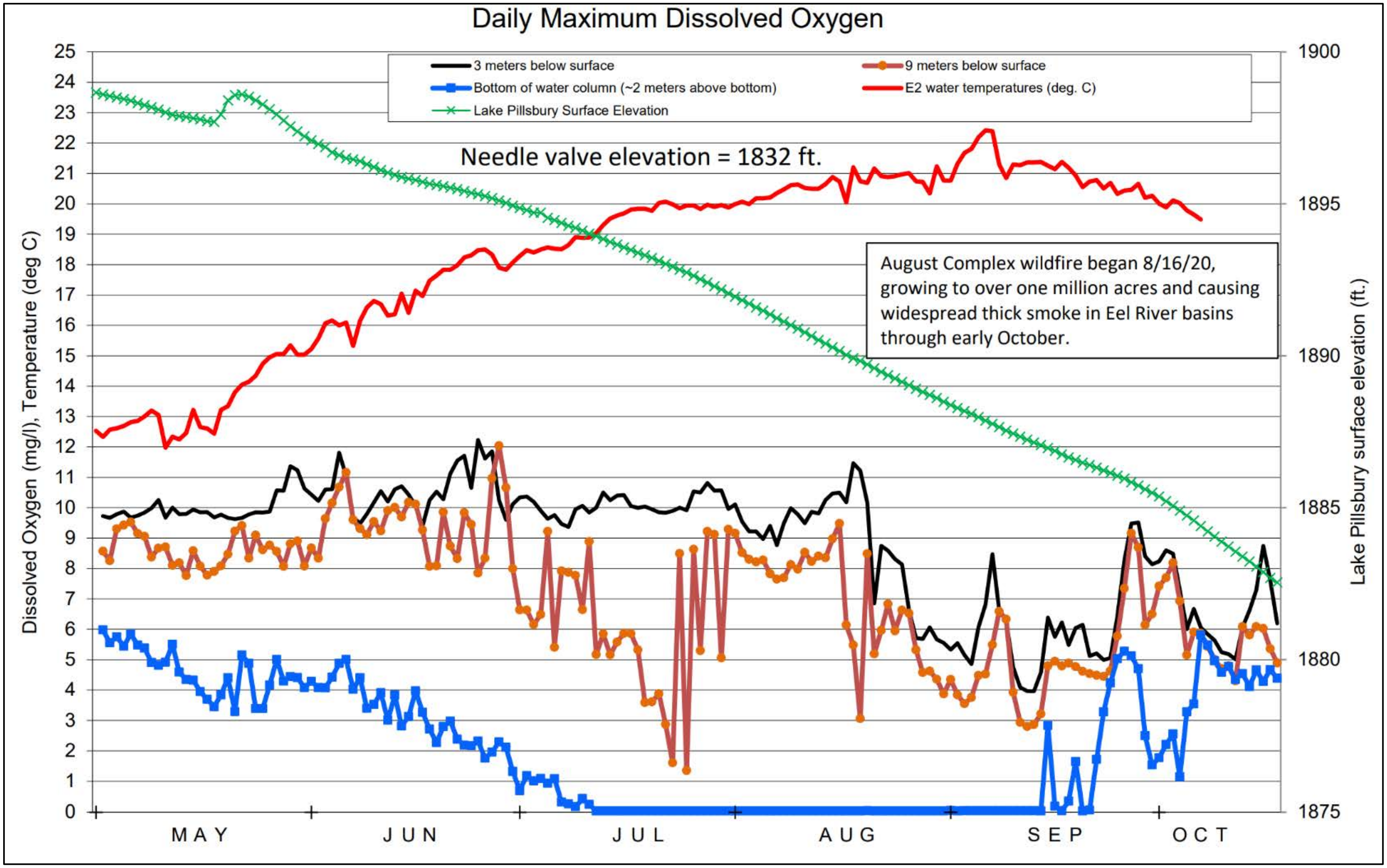


Figure 1. Daily Maximum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2020

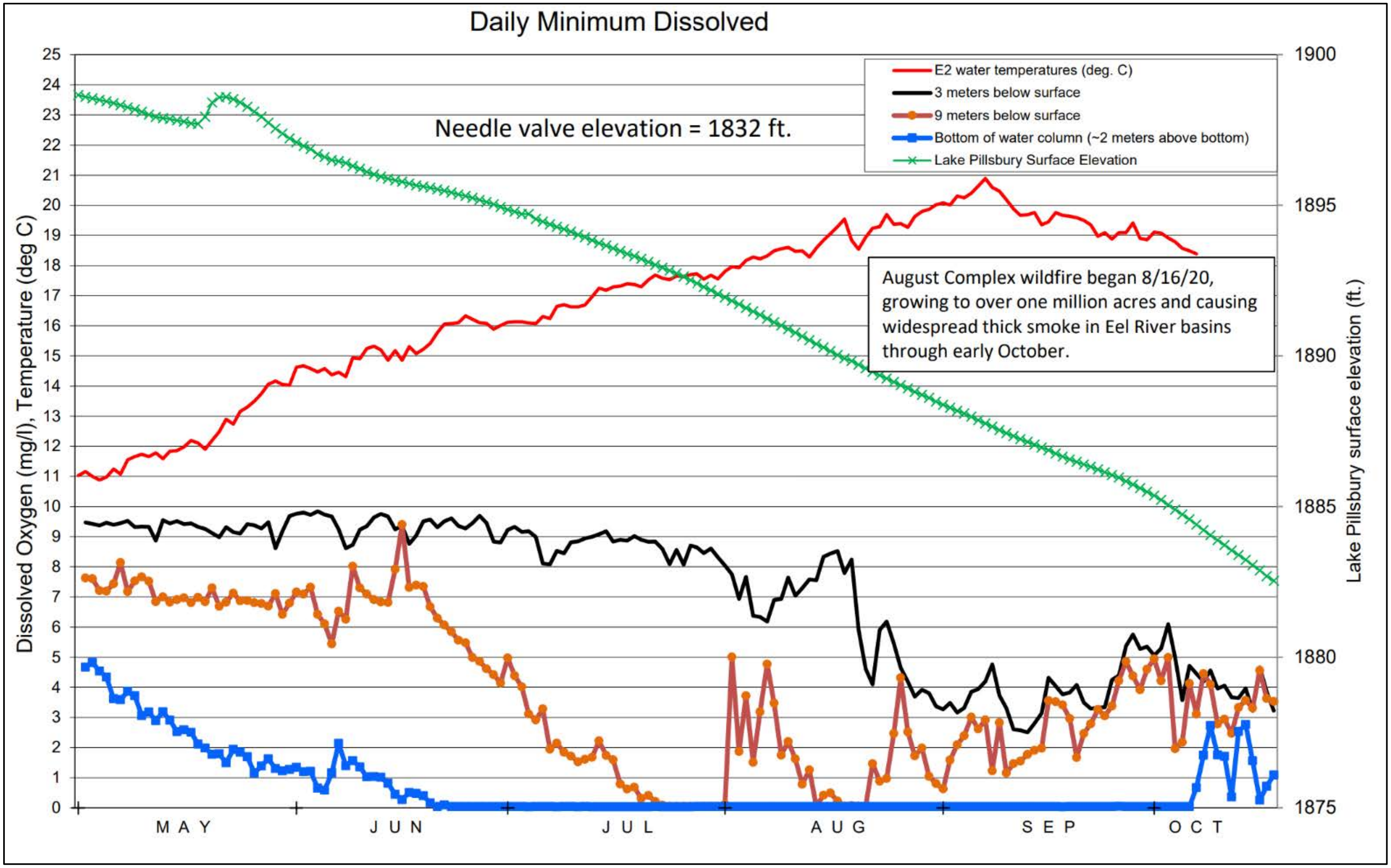


Figure 2. Daily Minimum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2020

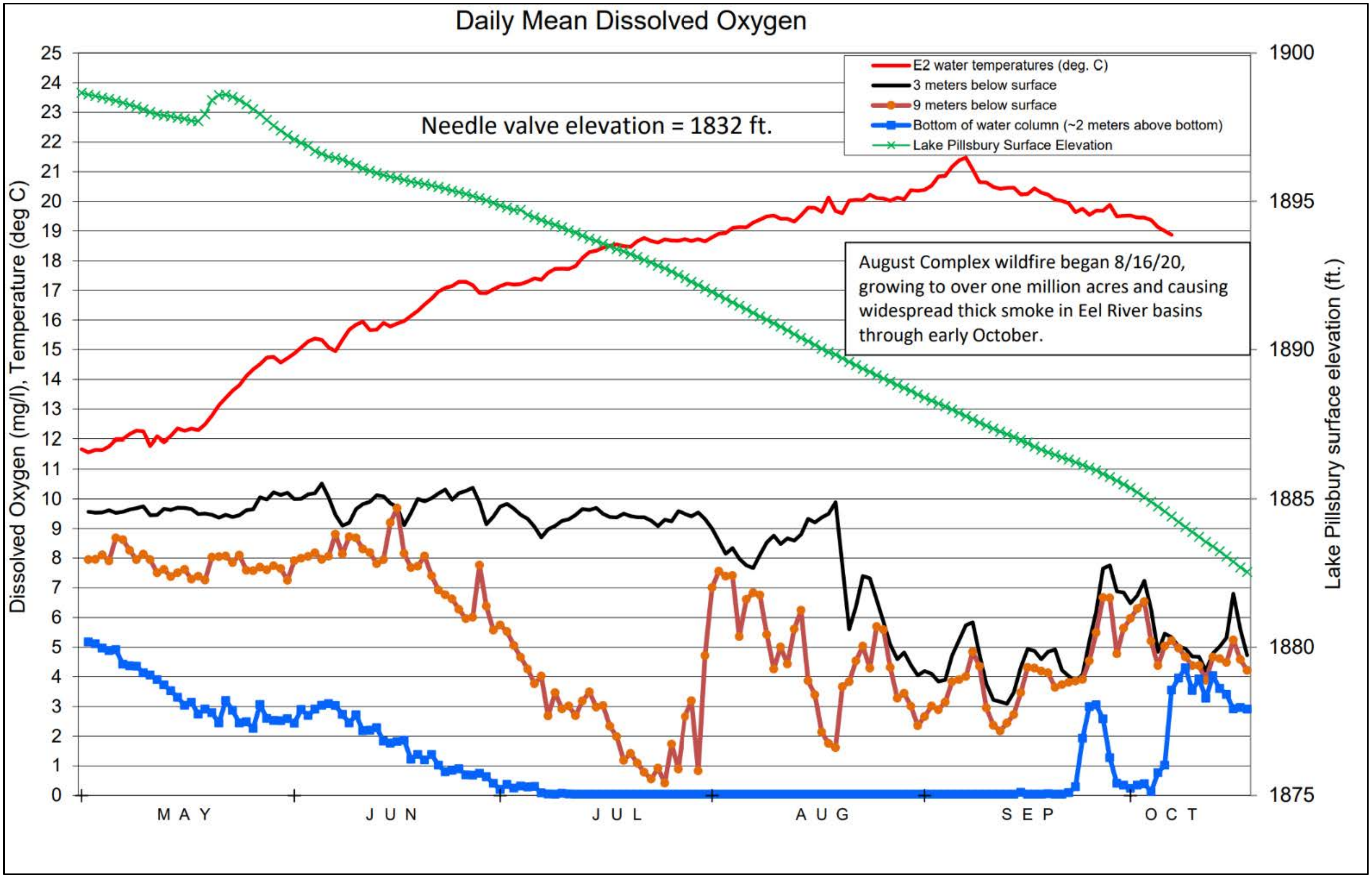


Figure 3. Daily Mean Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2020

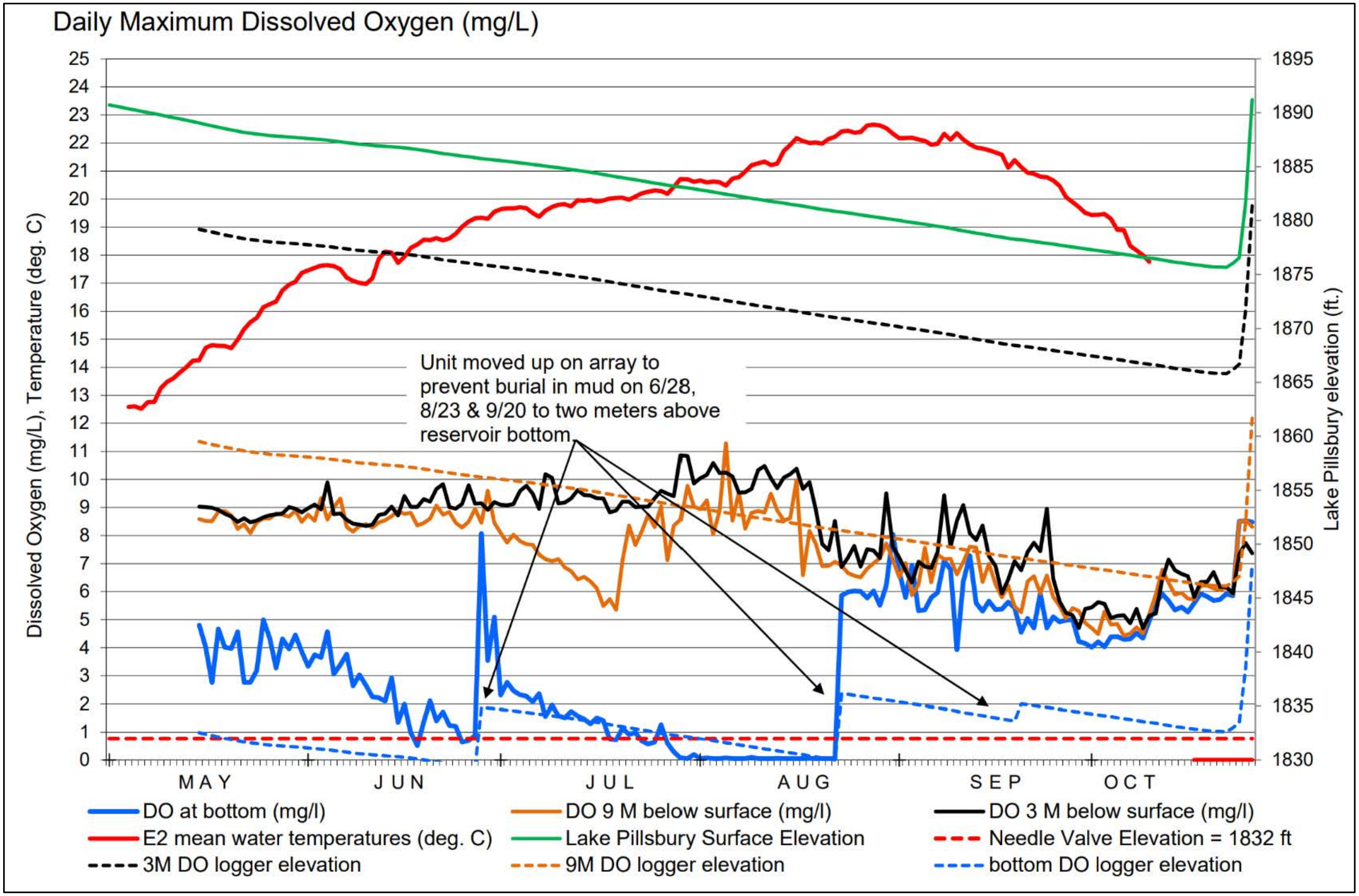


Figure 4. Daily Maximum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2021

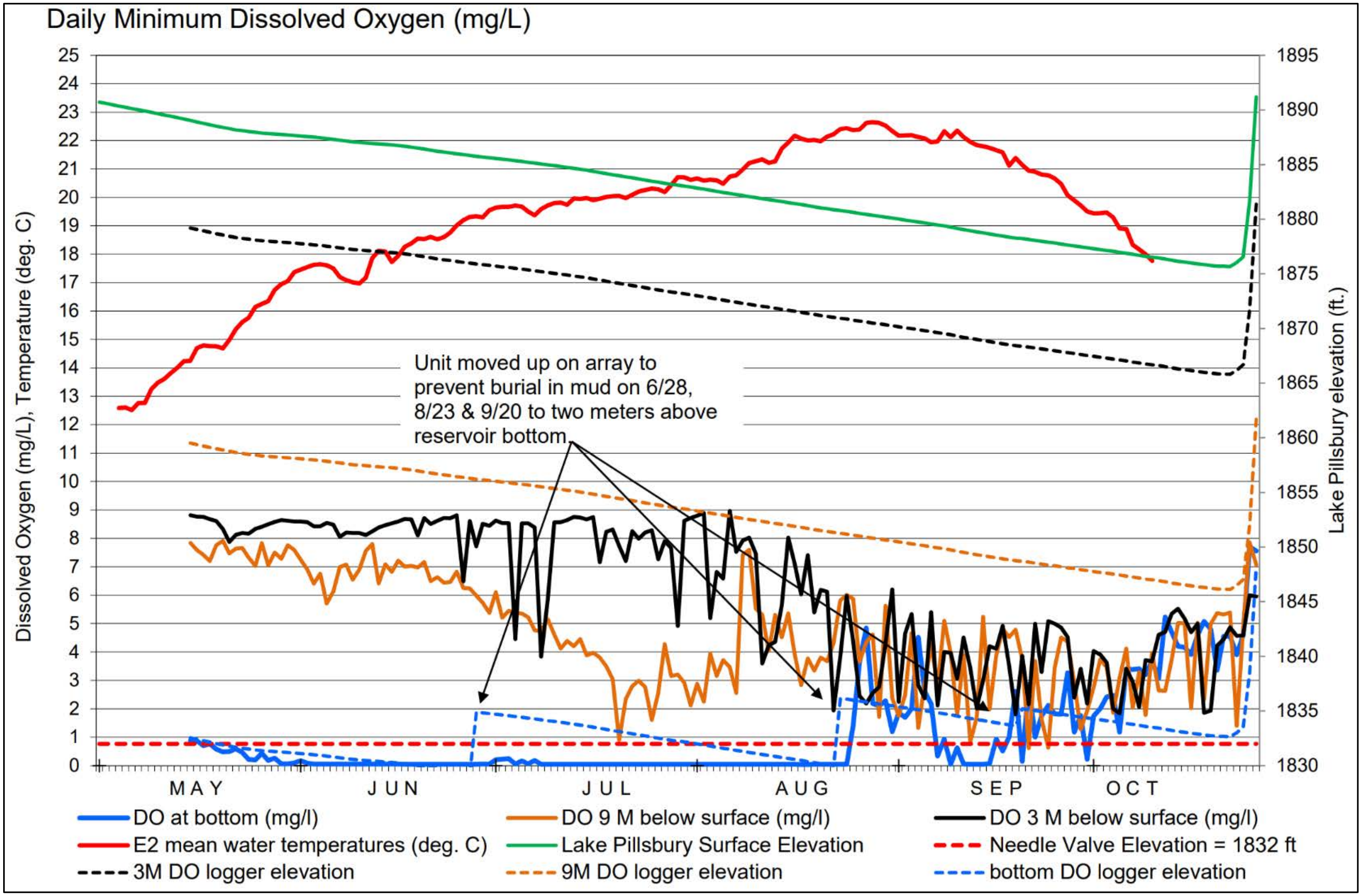


Figure 5. Daily Minimum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2021

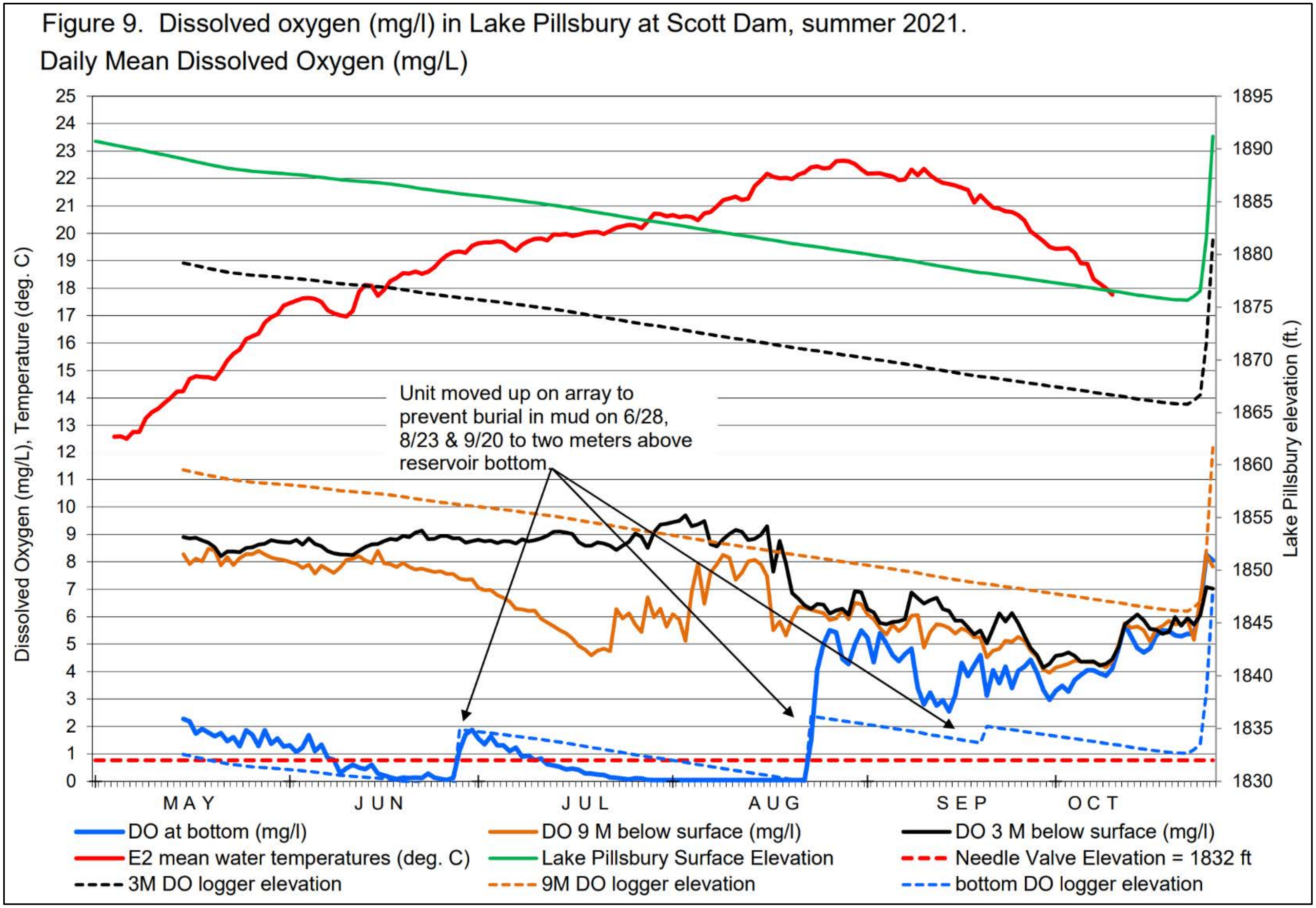


Figure 6. Daily Mean Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2021

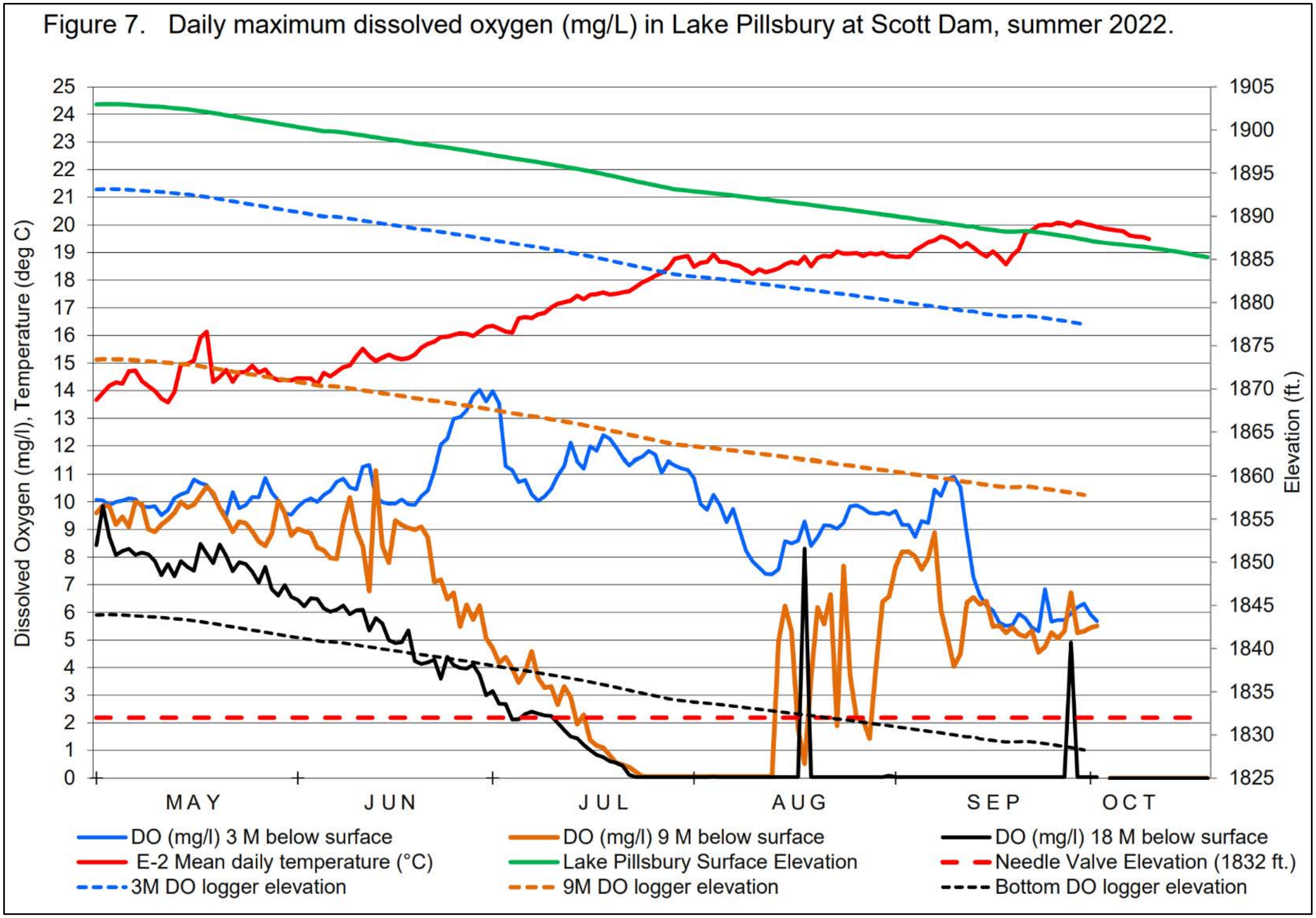


Figure 7. Daily Maximum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2022

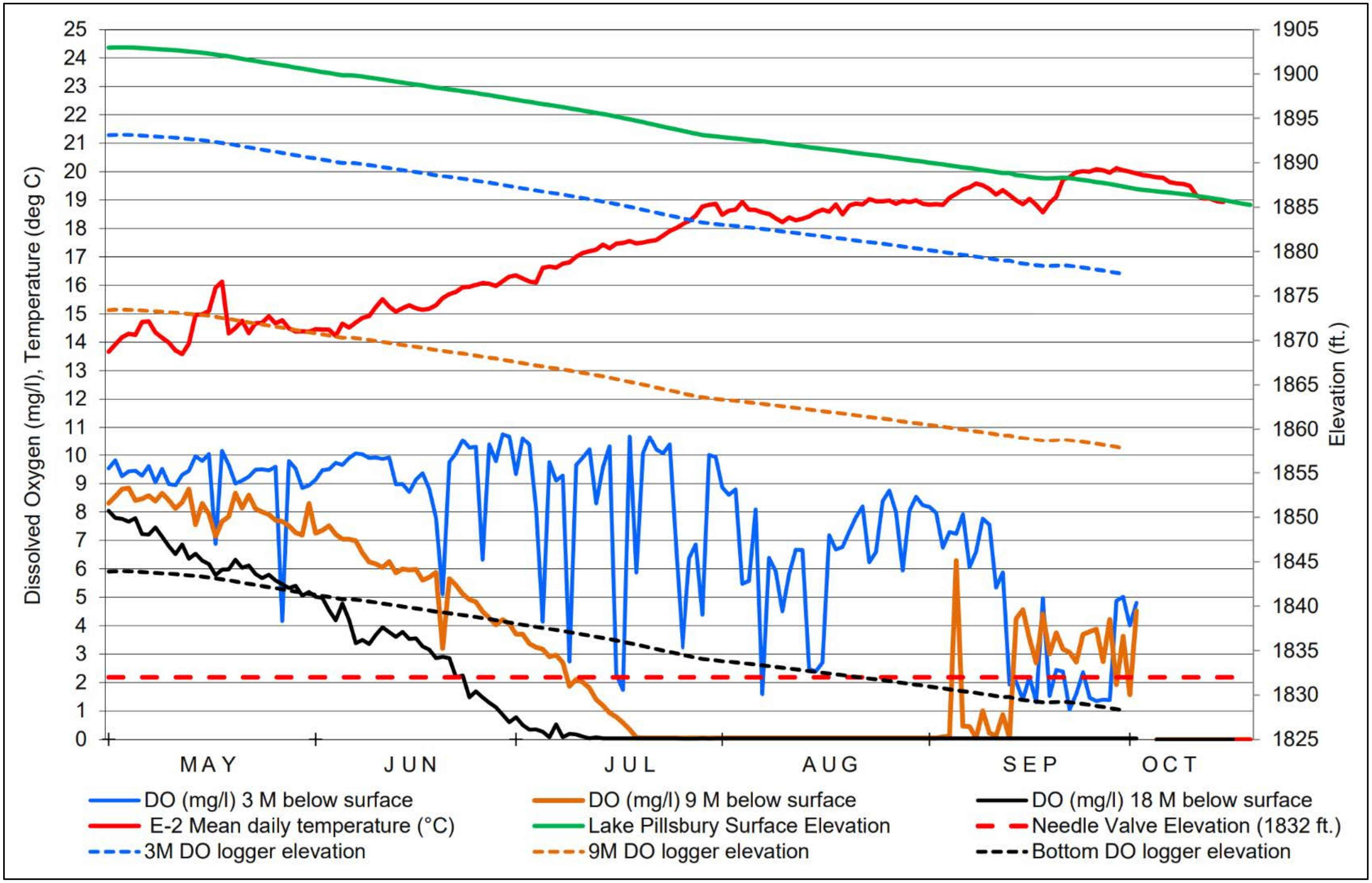


Figure 8. Daily Minimum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2022

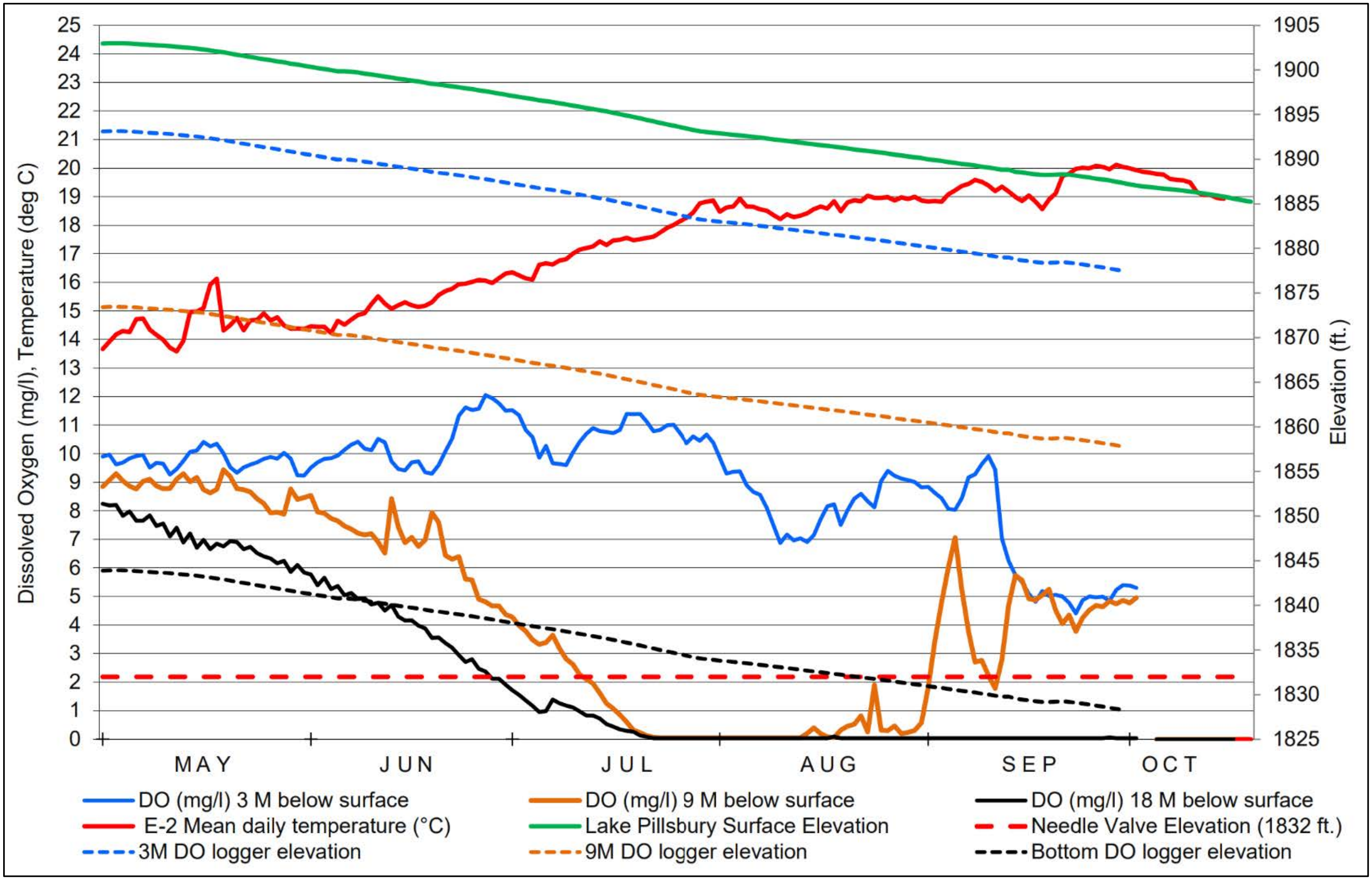


Figure 9. Daily Mean Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2022

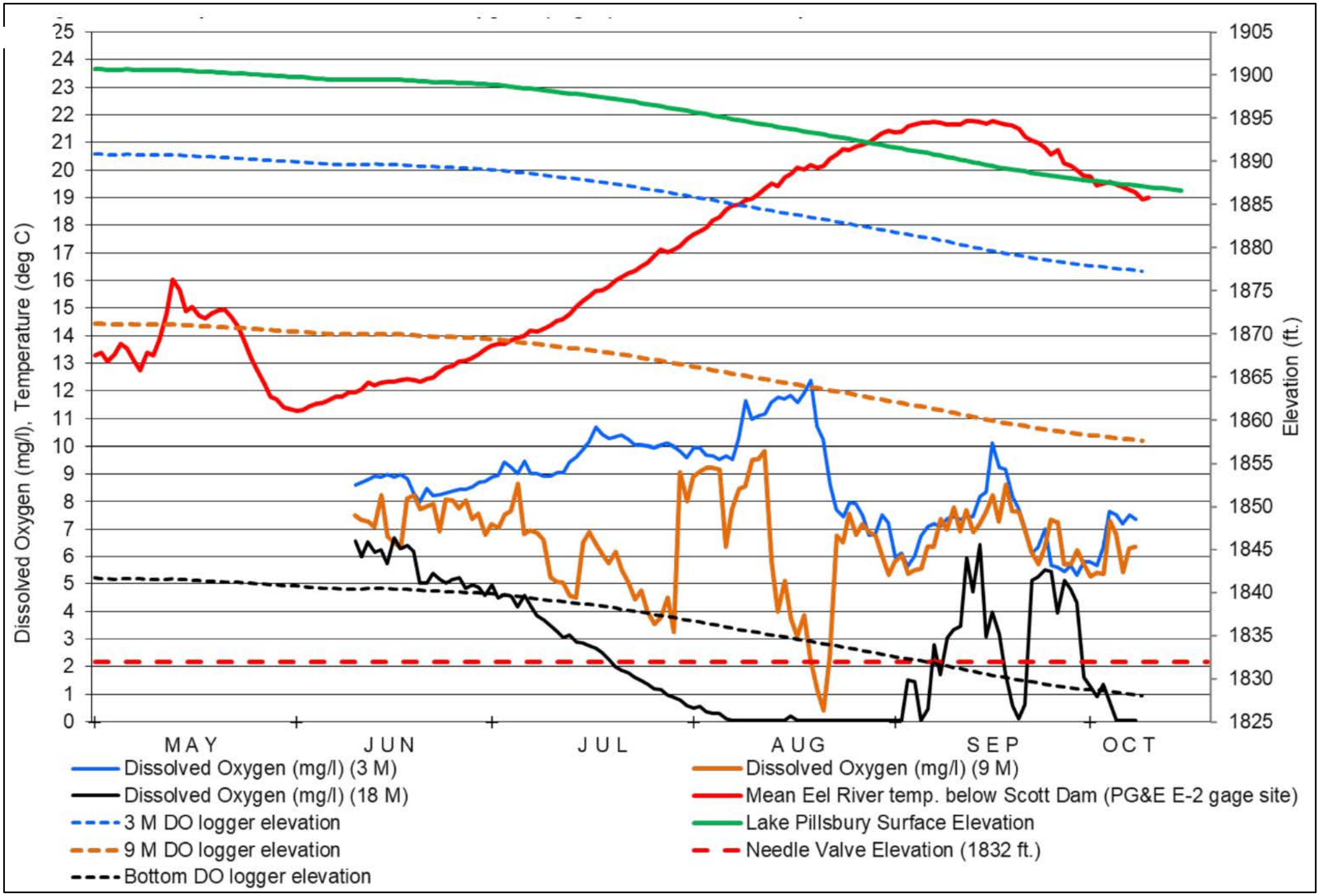


Figure 10. Daily Maximum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2023

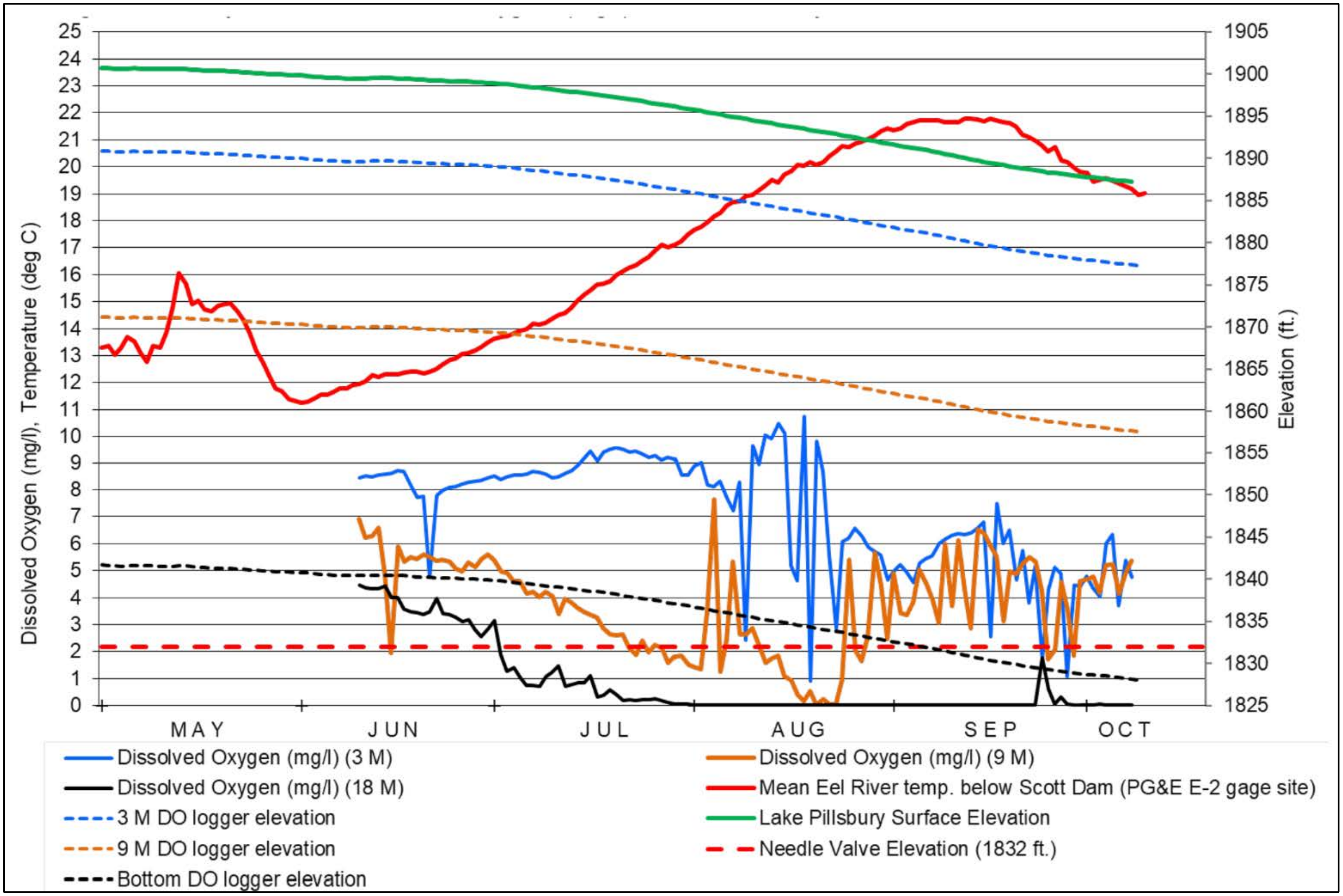


Figure 11. Daily Minimum Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2023

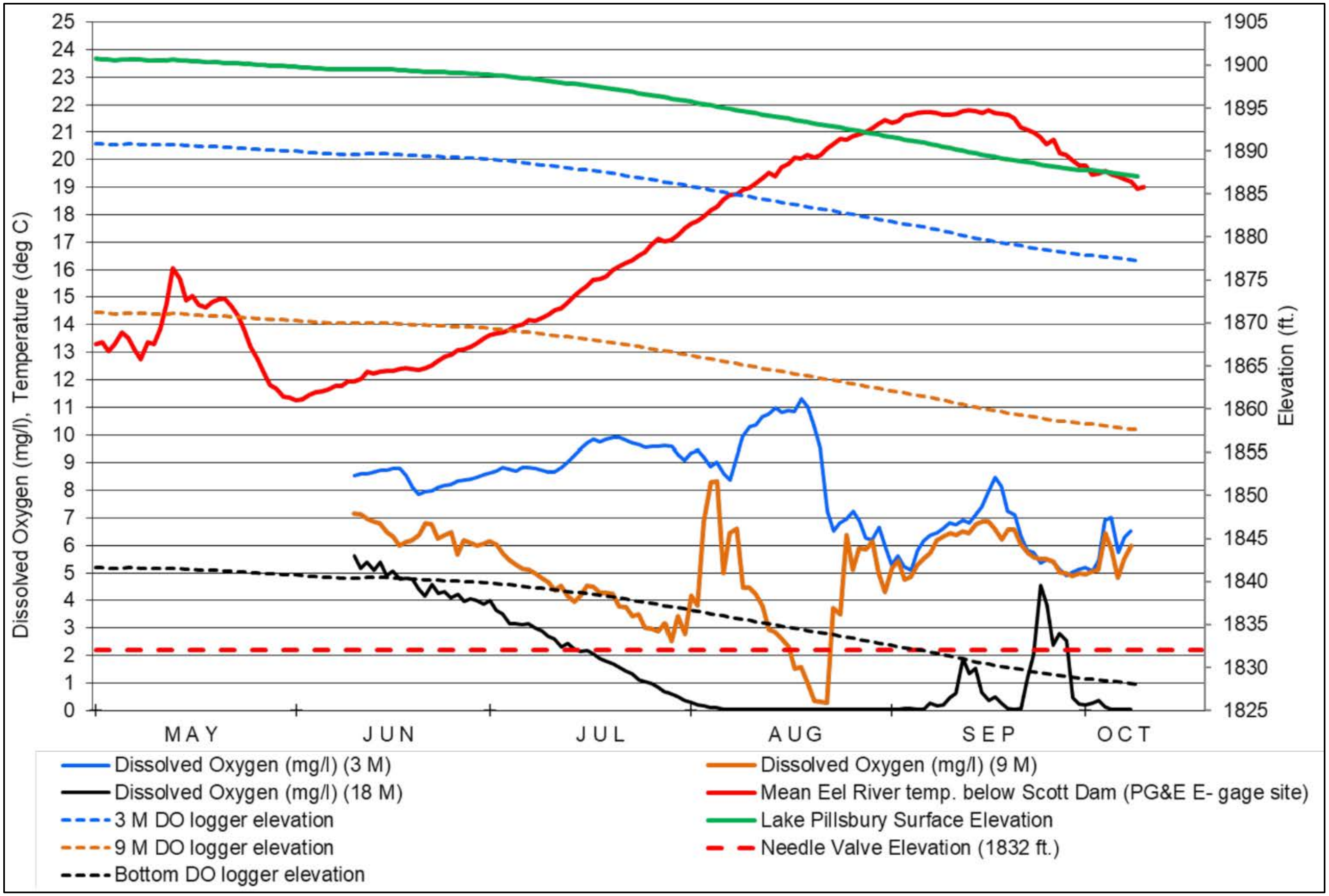


Figure 12. Daily Mean Dissolved Oxygen in Lake Pillsbury near Scott Dam for 2023

TABLE OF CONTENTS

List of Tables

List of Figures

List of Maps

List of Acronyms

°C	degrees Celsius
µm	micron
ac-ft	acre-feet
BMI	benthic macroinvertebrate
CalFish	California Cooperative Anadromous Fish and Habitat Data Program
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFGC	California Fish and Game Commission
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CPS	Coastal Pelagic Species Management Plan
CSCI	California Stream Condition Index
DPS	distinct population segment
EFH	essential fish habitat
ERF	Eel River Forum
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FEMA	Federal Emergency Management Agency
FEP	Fishery Ecosystem Plan
FERC	Federal Energy Regulatory Commission
FMP	fishery management plan
FR	Federal Register
FSS	Forest Service Sensitive
ft.	feet
HMS	West Coast Highly Migratory Species Fishery Management Plan
in.	inch
IPaC	Information for Planning and Consultation
km	kilometer
mg/kg	milligrams per kilogram

mg/L	milligrams per liter
mi.	mile(s)
mm	millimeter
MNF	Mendocino National Forest
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PCG	Pacific Coast Groundfish Fishery Species Management Plan
PCS	Pacific Coast Salmon Fisheries Management Plan
PFMC	Pacific Fisheries Management Council
PG&E	Pacific Gas and Electric Company
ppm	parts per million
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
PVC	polyvinyl chloride
PVID	Potter Valley Irrigation District
RM	river mile
RPA	Reasonable and Prudent Alternative
SRNF	Six Rivers National Forest
SSC	Species of Special Concern
SWRCB	State Water Resources Control Board
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAFS	Van Arsdale Fish Station
VTN	VTN Oregon Inc.

3.3.3 Fish and Aquatic Resources

3.3.3.1 Introduction

This section describes fish and aquatic resources in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). This section also describes rare, threatened, and endangered aquatic resources in the Project vicinity. A description of marine resources and botanical and terrestrial resources, including rare, threatened, and endangered species, is included in Section 3.3.18 and Section 3.3.4, respectively.

3.3.3.2 Information Sources

Existing relevant information reviewed for this discussion includes the following:

- *Final Environmental Impact Statement*, *Potter Valley Project* (Federal Energy Regulatory Commission (FERC) (1978);
- Fish resource studies and population monitoring in the Eel River from 1979 to 1982 (VTN Oregon Inc. [VTN] 1982) including:
  - Chinook salmon carcass surveys in Tomki Creek and the Eel River;
  - Aerial redd surveys;
  - Fish passage assessment at critical riffles between Outlet Creek and Cape Horn Dam;
  - Instream flow/habitat study;
  - Juvenile downstream migrant trapping study;
  - Summer fish population surveys; and
  - Water temperature monitoring from Lake Pillsbury to the confluence with Outlet Creek;
- Fish resource studies and population monitoring from 1985 to 1996 (SEC 1998), including:
  - Chinook salmon carcass surveys in Tomki Creek and the Eel River;
  - Assessment of adult salmonid migration in relation to streamflows;
  - Chinook salmon spawning criteria and refinement of instream flow/spawning habitat predictions from the VTN (1982) study;
  - Assessment of the 1987 fish ladder improvements;
  - Juvenile downstream migrant trapping study;
  - Assessment of downstream migration in relation to discharge and water temperature;
  - Assessment of adult return rates for fin-clipped hatchery steelhead;
  - Summer fish population surveys;

  - Water temperature monitoring from Lake Pillsbury to the confluence with Outlet Creek; and
  - Analysis of salmon and steelhead population trends and the possible effects of Project and non-Project-related factors on these trends;
- *Final Environmental Impact Statement, Proposed Changes in Minimum Flow Requirements at the Potter Valley Project* (FERC 2000);
- Biological opinion for the proposed license amendment for the Project (National Marine Fisheries Service [NMFS] 2002);
- The Eel River Action Plan, a compilation of information and recommended actions (Eel River Forum [ERF] 2016);
- Ongoing annual monitoring conducted by PG&E from 2006 to 2022, consisting of the following:
  - Sacramento pikeminnow (*Ptychocheilus grandis*) monitoring and suppression data from three stations above Cape Horn Dam (PG&E 2006a–2018a, 2019g, 2020a–2022a, 2023d, 2024c);
  - Summer water temperature monitoring from Lake Pillsbury to below the confluence with the Middle Fork Eel River (PG&E 2006b–2018b, 2019h, 2020b–2023b; 2024a);
  - Summer rearing fish population surveys (PG&E 2006c–2018c, 2019i, 2020c–2022c);
  - Chinook salmon carcass surveys at index sites in Tomki Creek and the Eel River (PG&E 2006d–2018d, 2019j, 2020d–2022d);
  - Annual performance monitoring of hydrologic and fish return data (PG&E 2006e–2018e, 2019k, 2020e–2022e, 2023a); and
  - Annual Van Arsdale Fish Screen Report (PG&E 2011f–2016f);
- Field data collected in support of 2018 relicensing surveys by PG&E and its contractors;
- Technical study summary reports for special-status amphibians and aquatic reptiles, special-status molluscs, water temperature, water quality, and fish passage (PG&E 2019a, 2019b, 2019c, 2019d, 2019e),
- The USFWS's Information for Planning and Consultation (IPaC) online tool (U.S. Fish and Wildlife Service [USFWS] 2024),
- The California Freshwater Species Database (Howard et al. 2015b);
- California Fish and Wildlife California Natural Diversity Database (CDFW 2024a);
- California Freshwater Species Database (Howard 2015b);
- *Technical Memorandum Executive Summary for Scott Dam Fish Ladder Feasibility Evaluation* for PG&E (PG&E 2018f); and
- The *Draft Eel River Restoration and Conservation Plan* (California Trout et al. 2024).

3.3.3.3 Overview of Fish and Aquatic Resources

This section provides a brief overview of fish and aquatic resources in the Project study area, which includes the Eel River from upstream of Lake Pillsbury downstream to the ocean, including the East Branch of the Russian River to Lake Mendocino. Detailed descriptions of fish and aquatic resources are provided for the Eel River (Section 3.3.3.4), Eel River estuary (Section 3.3.3.5), Lake Pillsbury (Section 3.3.3.6), Van Arsdale Reservoir (Section 3.3.3.7), East Branch Russian River (Section 3.3.3.8). Critical Habitat (Section 3.3.3.9), Essential Fish Habitat (Section 3.3.3.10), and Special Status Species (Section 3.3.3.11).

- The Eel River downstream of Lake Pillsbury, including the lower Eel River and estuary, provides aquatic habitat for several special-status aquatic species, including anadromous salmonids listed as threatened under the Endangered Species Act (ESA)—Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead (*O. mykiss*); threatened Pacific eulachon (*Thaleichthys pacificus*); and endangered tidewater goby (*Eucyclogobius newberryi*)—and species proposed for listing as threatened under the ESA—northwestern pond turtle (*Actinemys marmorata marmorata*) and longfin smelt (*Spirinchus thaleichthys*).

  There are other species of concern, including California Endangered Species Act (CESA) endangered summer steelhead (*O. mykiss irideus*), candidate species white sturgeon (*Acipenser transmontanus*) and species of special concern (SSC) green sturgeon (*Acipenser medirostris*), lamprey (*Entosphenus tridentatus* and *Lampetra* spp.), foothill yellow-legged frog Northwest/North Coast clade (*Rana boylii*), coastal tailed frog (*Ascaphus truei*), southern torrent salamander (*Rhyacotriton variegatus*), California floater (*Anodonta californiensis*), western pearlshell (*Margaritifera falcata*), and northern red-legged frog (*Rana aurora*). Additionally, the Eel River supports various non-listed native freshwater fishes such as sculpin (*Cottus* spp.), stickleback (*Gasterosteus* spp.), and sucker (*Catostomus* spp.), and sporadic runs of pink salmon (*O. gorbuscha*) and chum salmon (*O. keta*) have also occurred (Yoshiyama and Moyle 2010).

- Lake Pillsbury provides aquatic habitat for northwestern pond turtle and other non-listed amphibians, macroinvertebrates, and aquatic reptiles. Native fishes such as rainbow trout (*O. mykiss*) and Sacramento sucker (*Catostomus occidentalis*) are also present, along with various introduced species.

- Above Lake Pillsbury, the Eel River and Rice Fork provide habitat for foothill yellow-legged frog, northwestern pond turtle, and other non-listed native fishes, amphibians, macroinvertebrates, and aquatic reptiles.

- Considerable historical data exist to characterize the fish and aquatic resources in the Eel River. Long-term monitoring data for steelhead (1922 to present) and Chinook salmon (1946, 1947, 1950, and 1955 to the present) returning to the Van Arsdale Fish Station (VAFS) at Cape Horn Dam are available, as well as extensive monitoring and studies of fishery resources (escapement, spawning, rearing, outmigration, invasive Sacramento pikeminnow) and habitat conditions (habitat versus flow, water temperature, fish passage, fish entrainment) in the upper Eel River Watershed from 1979 to the present (e.g., studies related to the 1983 FERC relicensing and post-relicensing studies; 2018 relicensing studies).

- The Project currently modifies the aquatic habitat in the Eel River in the following ways:
  - Lake Pillsbury (Scott Dam), a 77,000 acre-feet (ac-ft) water storage reservoir, provides habitat for lentic sport fishes such as largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and rainbow trout. Lake Pillsbury also provides habitat for non-native Sacramento pikeminnow. Scott Dam blocks anadromous fish passage into the upper watershed and regulates flows in the Eel River during non-spill periods, modifying hydrologic characteristics (magnitude and timing of flows). Releases from the bottom of the reservoir provide cold water during the late spring through summer months for salmonid rearing in the Eel River downstream of the reservoir.
  - Van Arsdale Reservoir (Cape Horn Dam), located on the Eel River approximately 12 miles (mi.) below Lake Pillsbury, is a relatively small run-of-river diversion pool where water is diverted through the trans-basin Potter Valley Tunnel to the Potter Valley Powerhouse/Potter Valley, located in the East Branch Russian River Watershed. Water released from the tunnel/powerhouse flows into Lake Mendocino. Water from Lake Mendocino is used in Mendocino and Sonoma counties for irrigation, municipal and domestic water supply, recreation, and support of salmon and steelhead populations in the Russian River. As a result of Project storage and diversions, hydrologic characteristics (magnitude and timing of flows) in the Eel River are modified below Cape Horn Dam, and flows in the East Branch Russian River are augmented.
  - Minimum required streamflows have been established in the Eel River below Lake Pillsbury and below Van Arsdale Reservoir for the protection of Chinook salmon and steelhead populations, and in the East Branch Russian River for the support of a put-and-take rainbow trout fishery above Lake Mendocino. Prior to 1979, the year-round minimum streamflow requirement for the Eel River below Van Arsdale Reservoir was 2 cubic feet per second (cfs), but since 1979, more natural flow regimes have been implemented. Recent minimum streamflow requirements, as established by the NMFS's 2002 Reasonable and Prudent Alternative (RPA), for the Eel River below Lake Pillsbury and below Van Arsdale Reservoir were designed to mimic the pattern and timing of the natural hydrograph with sufficient flows for fall and winter migrations, spring emigrations, and summer rearing habitat. During the December to March period, the minimum RPA flow from Cape Horn Dam has a floor of 100 cfs and a cap of 140 cfs; however, the floor can drop to 25 cfs when there are exceptionally low inflows to Lake Pillsbury (NMFS 2002). Between 2013 and 2022, PG&E requested variances from FERC for 7 out of the 10 years due to inadequate water supply and the inability to meet RPA flows. In 2023 and 2024, PG&E requested flow variances to support cooler water temperature releases from Lake Pillsbury due to changes in operations resulting in lower water storage.
  - Water temperatures in the Eel River below Lake Pillsbury are colder during the late spring and summer than under unimpaired conditions. The cold water during summer provides rearing habitat for juvenile steelhead. This, along with nutrients released from the reservoir, promotes rapid fish growth. However, cold water temperatures in spring

can delay the outmigration of juvenile salmonids until a time when downstream temperatures are inhospitable. Warm surface water releases combined with pulse flow releases have been used to encourage timely outmigration. Downstream of Van Arsdale Reservoir, summer water temperatures in the Eel River warm rapidly to equilibrium levels, which results in habitat conditions that are marginal to lethal for juvenile steelhead for several miles below the reservoir.

- Fish passage (upstream and downstream) for migratory fish species has existed at Cape Horn Dam (Van Arsdale pool-and-weir ladder) since 1909, with modifications of the fish ladder to improve fish passage in 1915, 1962, 1987, and 2020 and experimental improvements for Pacific lamprey passage (beginning in 2014–2016). A synopsis of passage/counts at VAFS is provided below:
  - Annual adult steelhead counts at VAFS between 1922 and the late 1950s were frequently above 3,000 to 4,000 fish. Since then, steelhead counts have tapered down to less than 1,000 to 2,000 fish and, in many years, far less than 500 fish. Many factors have no doubt contributed to the observed declines in fish numbers at VAFS and elsewhere in the watershed, including logging, road construction, livestock grazing, agriculture (both legal and illegal), introduction of invasive species, natural flood events, and poor ocean conditions. In the late 1990s, a spike in steelhead numbers occurred, with three successive years ranging from approximately 2,400 to 7,700 fish; however, the spike was heavily influenced by hatchery fish. Since 2008, only one hatchery steelhead has been present in the counts, which have ranged from 59 to 935 fish.
  - Annual Chinook salmon counts at VAFS from 1946 (first year of recorded Chinook salmon counts) to the early 1980s were typically less than 100 fish, with many years having a count of zero. An exception to this was two successive years in the late 1940s that had over 900 fish. Low flows in the Eel River below Van Arsdale Reservoir prior to the 1979 instream flow modifications likely affected the number of Chinook salmon reaching VAFS. In the mid- to late-1980s, a spike in numbers occurred, ranging up to over 1,700 fish; however, counts dropped back to single-digit levels during the early 1990s. Counts increased dramatically again beginning in the mid-1990s and have since been sustained at levels typically over 300 fish. Numbers in the late 1990s through the early 2000s were influenced by a hatchery component. During the 10-year period from 2005 to 2015, adult Chinook salmon numbers ranged from 215 to 3,471 (with only three hatchery fish present in the counts), including three successive years over 2,000 fish (2010–2012). In recent years, numbers have ranged from 64 to 457, with no hatchery fish present in the counts.
  - Migratory Pacific lamprey are common in the vicinity of the Project, but they had not been included in the annual counts at VAFS until 2016. Experimental additions to the Cape Horn Dam Fish Ladder (e.g., polyvinyl chloride [PVC] bypass pipe for upstream lamprey migration) have greatly enhanced passage (see below).
- Chinook salmon and steelhead spawning occurs in the mainstem Eel River below Lake Pillsbury and Van Arsdale Reservoir. Substantial Chinook salmon and steelhead spawning

habitat also exists in larger tributaries to the Eel River such as Tomki Creek and Outlet Creek, and steelhead spawning habitat exists in numerous smaller tributaries to the Eel River that are unaffected by the Project.

- Entrainment protection for downstream migrating fish is provided by the Van Arsdale fish screens at the Potter Valley Tunnel Intake. The original horizontal traveling fish screen was constructed in 1972. This screen was replaced with a pair of inclined plane screens in 1995 to better protect downstream migrant fish and improve operational reliability.
- Summer rearing habitat for juvenile steelhead in the vicinity of the Project is highly dependent on the occurrence of cool water temperatures. The cold-water releases from Lake Pillsbury provide suitable conditions in the Eel River from Lake Pillsbury to Van Arsdale Reservoir. As river temperatures below Van Arsdale Reservoir rise, the Eel River provides suitable summer rearing habitat in most years only as far downstream as Thomas Creek, 8 mi. below the reservoir. Summer rearing habitat below this point is generally limited to areas of cool water inflow. Suitable rearing habitat also occurs in numerous cool-water tributaries to the Eel River in the vicinity of the Project.
- Since the introduction of Sacramento pikeminnow to the Eel River Watershed (presumably in Lake Pillsbury) around 1979, this species has spread throughout most of the watershed and has established large populations. Their proliferation and the resulting competition with, and predation on, native fish species has greatly affected overall fish population levels and is viewed as a major obstacle to the recovery of anadromous salmonids in the Eel River Watershed.
- Foothill yellow-legged frog and northwestern pond turtle have commonly been observed within the watershed.

3.3.3.4 Eel River

The study area for this discussion is focused on the Eel River upstream of Lake Pillsbury to the Middle Fork Eel River, but also includes the Eel River from the Middle Fork Eel River to the Eel River estuary (where data are available) (Table 3.3.3-1). Table 3.3.3-1 also identifies the river mile (RM) location of tributary confluences. The Eel River estuary is discussed in greater detail in Section 3.3.3.5. The following section also includes information on several tributary streams, and potential habitat in the Eel River above Lake Pillsbury is discussed in relation to fish passage at Scott Dam.

Table 3.3.3-1. River miles of the Eel River and East Branch Russian River.

Watershed/River	River Mile Location[1]
Eel River Watershed	
Eel River—Headwater to Cape Horn Dam (Headwater)	**197.0–156.8**
Headwater	197.0
Lake Pillsbury Inlet	173.2
Scott Dam (Lake Pillsbury)	168.5

Watershed/River	River Mile Location[1]
U.S. Geological Survey (USGS) Gage 11470500 (Below Scott Dam)	167.8
Soda Creek	167.4
Benmore Creek	166.4
Dashiell Creek	162.9
Alder Creek	162.0
Bucknell Creek	161.2
Trout Creek	160.4
Cape Horn Dam (Van Arsdale Reservoir)	156.8
Eel River—Cape Horn Dam to Middle Fork Eel River (Upper)	**156.7–119.3**
USGS Gage 11471500 (Van Arsdale Dam)	156.7
Tomki Creek	153.0
Thomas Creek	148.9
Garcia Creek	147.1
Emandal Resort	146.2
Twin Bridges Creek	138.6
Fish Creek	134.0
USGS Gage 11472150 (Dos Rios)	126.2
Outlet Creek	126.0
Middle Fork Eel River	119.3
Eel River—Middle Fork Eel River to Ocean (Lower)	**119.3–0**
North Fork Eel River	96.4
South Fork Eel River	40.5
Larabee River	36.5
Van Duzen River	12.9
Estuary	7.0
Ocean	0.0
East Branch Russian River Watershed (Potter Valley Powerhouse Tailrace to Lake Mendocino Ordinary High-Water Mark)	**Length ~11 mi.**

[1] Eel River miles and lengths are from the report of the *Water Management Technical Subcommittee – River Mile Index,* prepared by the Pacific Southwest Inter-Agency Committee Technical Subcommittee (June 1973).

Physical Environment

Aquatic Habitat

The Eel River flows 12 mi. from Scott Dam (Lake Pillsbury) westward to Cape Horn Dam (Van Arsdale Reservoir), with an average slope of 29 feet (ft.) per mile. Downstream from Cape Horn Dam, the river turns northwestward and flows approximately 55 mi., with an average slope of 16 ft. per mile, to its confluence with the Middle Fork Eel River. Downstream from the confluence of the Middle Fork Eel River, the Eel River continues northwestward and flows approximately 22 mi. to the confluence with the North Fork Eel River, with an average slope of 0.25 ft. per mile. The South Fork Eel River enters the Eel River approximately 38 mi. upstream of the estuary, and the Van Duzen River confluence is approximately 6 mi. upstream of the estuary. The average slope in this reach decreases to about 0.07 to 0.05 percent, before becoming nearly flat as the river enters the Pacific Ocean.

The upper Eel River between Scott Dam and Outlet Creek (31 mi. downstream of Cape Horn Dam) occupies a relatively narrow valley with little floodplain development. Riparian vegetation occurs as thin bands (typically no more than 40 ft. wide) along the water’s edge.

Downstream of the Middle Fork Eel River, there are extensive sediment bars that are nearly continuous along the river channel. At low flow, the river is typically a single thread (sometimes multi-thread as the channel splits around mid-channel bars), sinuous channel. Minimal riparian vegetation is established along the low-flow channel or on sediment bars, which indicates a dynamic channel with frequently occurring floods capable of limiting vegetation establishment. From near the Van Duzen River confluence downstream into the estuary, the Eel River transitions into a branching channel pattern characterized by multiple channel threads flowing around vegetated islands.

Additional information on riparian habitat and channel geomorphology in the Eel River is presented in Sections 3.3.4 and 3.3.7.

High-quality spawning habitat for anadromous fish is maintained in the reach below Scott Dam, due to the large quantity of gravel contributed by Soda Creek (RM 167.4), located 1.1 mi. downstream of the dam (SEC 1998). Two large tributaries, Tomki Creek (RM 153.0, 3.8 mi. downstream of Cape Horn Dam) and Outlet Creek (RM 126.0, 31 mi. downstream of Cape Horn Dam), provide a significant amount of spawning and rearing habitat for anadromous salmonids (SEC 1998). Small unregulated tributaries to the Eel River, such as Soda Creek (RM 167.4), Benmore Creek (RM 166.4), Bucknell Creek (RM 161.2), Trout Creek (RM 160.4), Thomas Creek (RM 148.9), and Garcia Creek (RM 147.1) provide habitat for fish and other aquatic species, including steelhead spawning and rearing. The small tributaries generally provide cool water suitable for steelhead summer rearing; however, naturally low flows during the summer may limit their productivity (VTN 1982).

Summer water temperatures in the Eel River between Scott Dam and Van Arsdale Reservoir are colder during the late spring and summer than would occur under unimpaired conditions. The cold water during summer provides suitable rearing habitat for juvenile steelhead and, along with nutrients released from Lake Pillsbury, promotes rapid fish growth. Downstream of Van Arsdale

Reservoir, summer water temperatures in the Eel River warm rapidly to equilibrium levels, which result in habitat conditions that are marginal to lethal for juvenile steelhead several miles below the reservoir (SEC 1998). Annual reports associated with implementation of PG&E's Summer Water Temperature Monitoring Plan (PG&E 2006b–2018b, 2019h, 2020b–2022b, 2023a, 2024a) provide water temperature data at 27 monitoring locations in the Eel River from above Lake Pillsbury to below the confluence of the Middle Fork Eel River. Information on water temperatures and water quality in the study area is presented in Section 3.3.

Fish Passage Barriers

Scott Dam

Construction of Scott Dam in 1921 created a 130-ft.-high upstream migration barrier to fish passage. No upstream fish passage facilities exist at the dam. The amount of riverine habitat upstream of Scott Dam inaccessible to anadromous salmonids (spawning and rearing) and the estimated potential numbers of returning fish in this area differ significantly based on various reports.

The VTN (1982) study estimated that in the major channels and tributaries upstream of Lake Pillsbury, Chinook salmon and steelhead could spawn in 25.2 mi. of the Eel River and tributaries and that an additional 10.5 mi. of habitat was inundated by Lake Pillsbury (35.7 mi. total). VTN (1982) also estimated that steelhead could have access to an additional 22.7 mi. of minor channels in the tributaries (58.4 mi. total). The study estimated "current" potential spawning densities at 35 Chinook salmon/mile and 42 steelhead/mile (based on adult salmon and steelhead returns in the Eel River below Cape Horn Dam and in Tomki Creek). Combining the spawning densities with the major habitat length above Scott Dam (35.7 mi.) estimates of run sizes were 1,250 Chinook salmon and 1,499 steelhead (VTN 1982).

NMFS's biological opinion (NMFS 2002) referenced the VTN study and estimated 2,000 to 4,000 fall Chinook salmon and winter steelhead could have spawned above Scott Dam historically. NMFS (2002) also referenced studies by the Mendocino National Forest (MNF) (U.S. Forest Service [USFS] and U.S. Bureau of Reclamation 1995), which estimated "100 to 150 mi. of potential anadromous salmonid habitat blocked by the dam." The MNF document stated, "About 100 mi. of anadromous fish habitat were made inaccessible to returning salmon and steelhead" (ERF 2016:19). Cooper et al. (2020), without addressing all the potential tributary barriers, estimated much larger amounts of habitat upstream of Scott Dam: 288 mi. for steelhead spawning and 181 mi. for steelhead summer rearing and 94 mi. for Chinook salmon spawning and rearing.

Although relicensing efforts were not completed, PG&E's relicensing studies in 2018[1] included helicopter surveys of habitat in all tributaries upstream of Scott Dam, targeted field surveys for barrier data collection, and water temperature data collection. Table 3.3.3-2 summarizes the results for Chinook salmon and steelhead, including different classes of steelhead habitat (e.g., temperature impaired). Map 3.3.3-1 through Map 3.3.3-6 (PG&E 2019c [2018 relicensing surveys]) show the results of the field surveys including barriers and water temperature monitoring locations.

1 These studies were not fully completed.

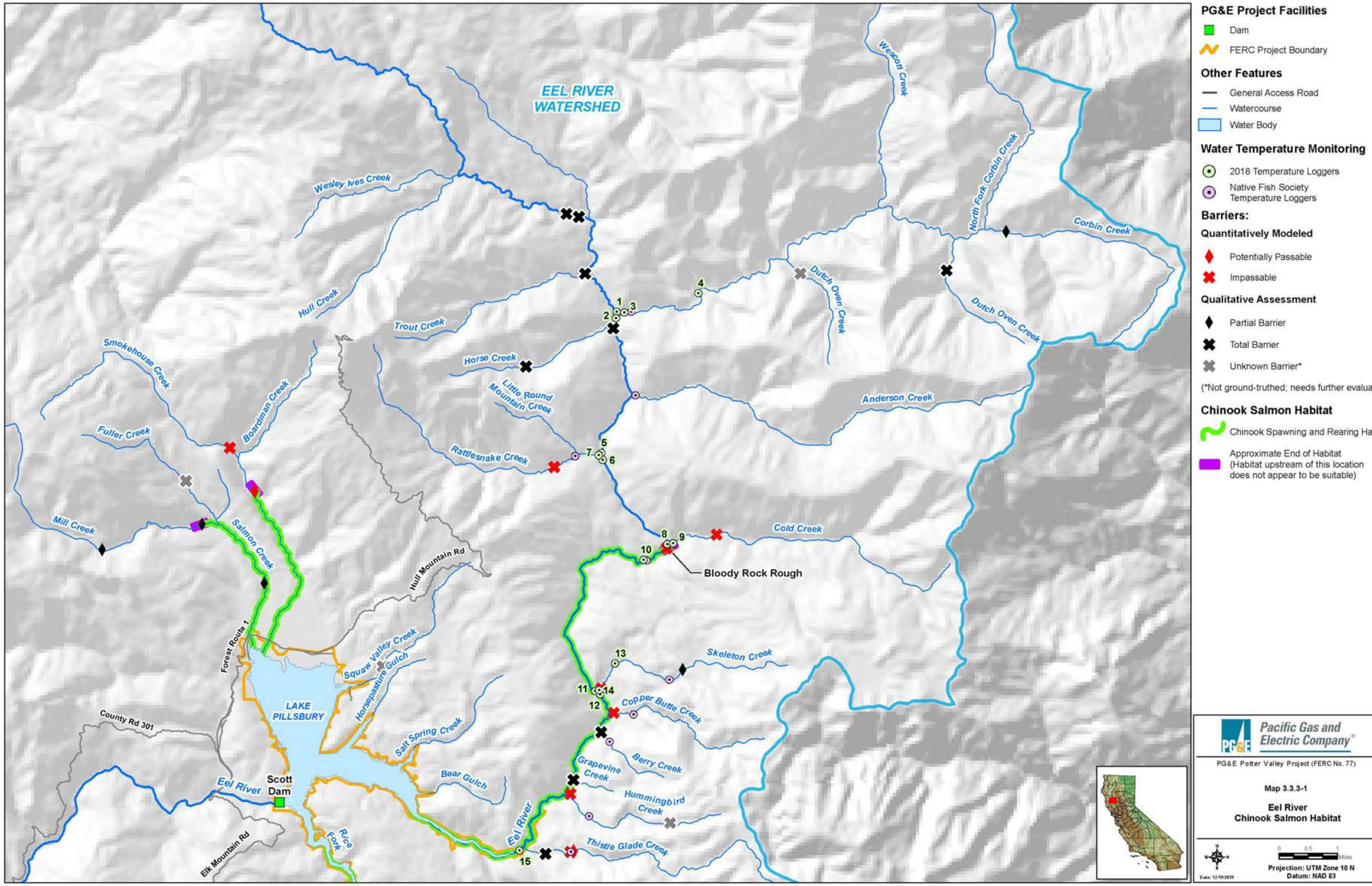
This Page Intentionally Left Blank

Table 3.3.3-2. Length (miles) of Chinook and steelhead habitat upstream of Scott Dam (see Maps 3.3.3-1 through 3.3.3-6).

Stream Name	Steelhead Habitat (miles)										Chinook Habitat (miles)	
	No Habitat	Spawning and Rearing	Spawning Only	Rearing Only	Potential Spawning and Rearing*	Potential Rearing Only*	Spawning and Rearing No Temperature Data	Potential Spawning and Rearing* No Temperature Data	Spawning and Rearing Temperature Impaired	Potential Spawning and Rearing* Temperature Impaired	No Habitat	Spawning and Rearing
Eel River Mainstem (downstream to upstream)												
Eel River	9.1	0	0	0	0	0	0	2.3	8.3	5.0	16.4	8.3
Eel River (inundated by Lake Pillsbury)	0	0	0	0	0	0	0	0	5.0	0	0	5.0
Subtotal (Eel River Mainstem)	*9.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*2.3*	*13.3*	*5.0*	*16.4*	*13.3*
Eel River Tributaries (downstream to upstream)												
Thistle Glade Creek	5.3	0	0	0.4	0	0	0	0	0	0	5.7	0
Hummingbird Creek	3.2	0	0	0	0	0	0	0	0	0	3.2	0
Grapevine Creek	0.8	0	0	0	0	0	0	0	0	0	0.8	0
Berry Creek	1.5	0	0	0	0	0	0	0	0	0	1.5	0
Copper Butte Creek	3.1	0	0	0.1	0	0	0	0	0	0	3.2	0
Skeleton Creek	3.9	0	0	0.1	0	0	0	0	0	0	4.0	0
Cold Creek	4.9	0	0	0	0.9	0	0	0	0	0	5.8	0
Rattlesnake Creek	4.7	0	0	0	0.9	0	0	0	0	0	5.6	0
Anderson Creek	3.2	0	0	0	4.7	0	0	0	0	0	7.9	0
Horse Creek	3.2	0	0	0	0	0	0	0	0	0	3.2	0
Corbin Creek	4.1	0	0	0	0	0	0	7.8	0	1.7	13.6	0
Dutch Oven Creek	3.9	0	0	0	0	0	0	0.9	0	0	4.8	0
Wescott Creek	4.3	0	0	0	0	0	0	1.8	0	0	6.1	0
North Fork Corbin Creek	2.1	0	0	0	0	3.2	0	0	0	0	5.3	0
Trout Creek	4.0	0	0	0	0	0	0	0	0	0	4.0	0
Unnamed Tributary to Eel River	3.0	0	0	0	0	0	0	1.0	0	0	0	0
Subtotal (Eel River Tributaries)	*55.2*	*0.0*	*0.0*	*0.6*	*6.5*	*3.2*	*0.0*	*11.5*	*0.0*	*1.7*	*74.7*	*0.0*
Rice Fork Mainstem (downstream to upstream)												
Rice Fork	1.6	7.3	1.7	0	0	0	0	0	9.1	0	3.3	16.4
Rice Fork (inundated by Lake Pillsbury)	0	0	0	0	0	0	0	0	2.7	0	0	2.7
Subtotal (Rice Fork Mainstem)	*1.6*	*7.3*	*1.7*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*11.8*	*0.0*	*3.3*	*19.1*

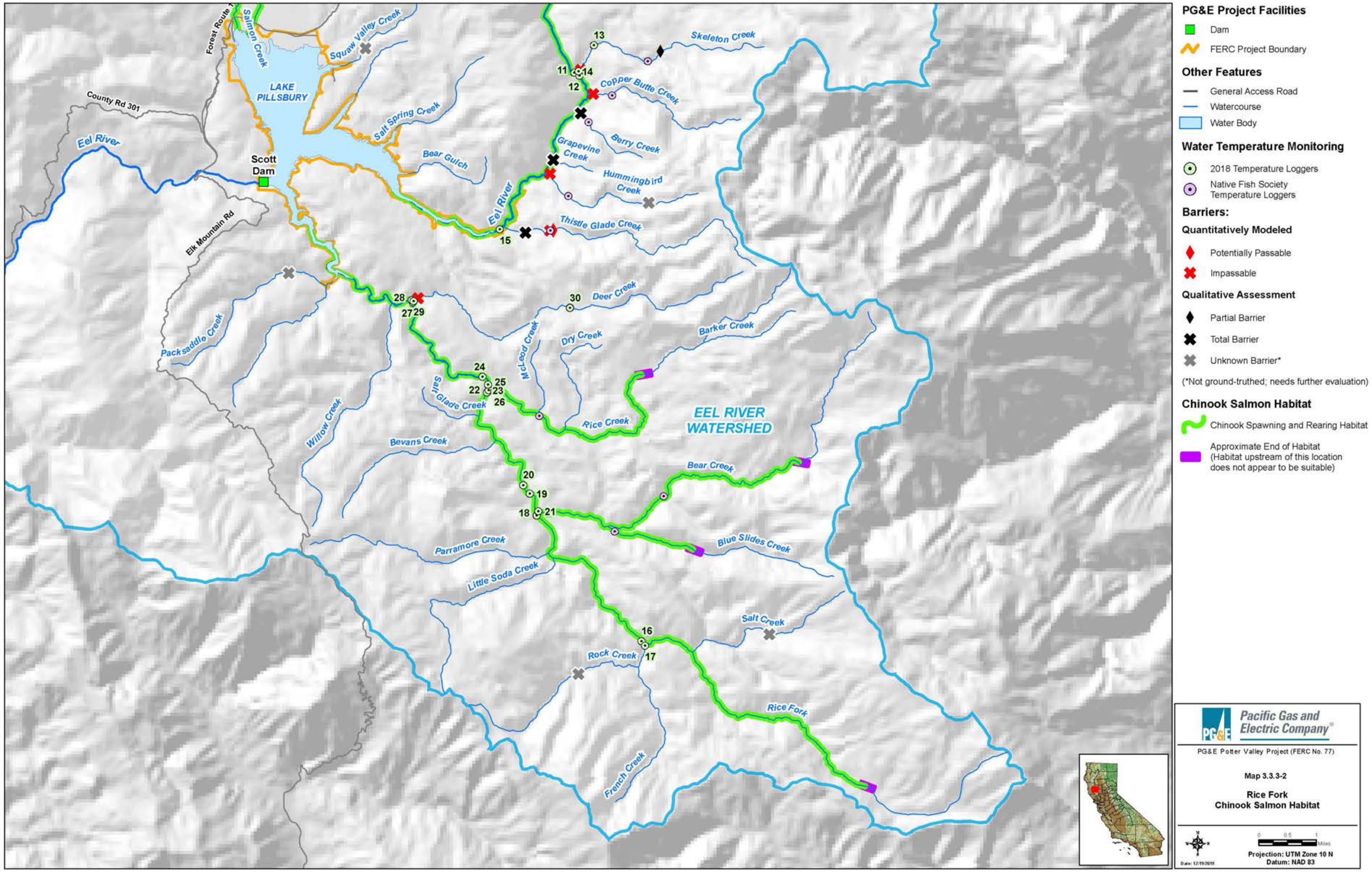
Stream Name	Steelhead Habitat (miles)										Chinook Habitat (miles)	
	No Habitat	Spawning and Rearing	Spawning Only	Rearing Only	Potential Spawning and Rearing*	Potential Rearing Only*	Spawning and Rearing No Temperature Data	Potential Spawning and Rearing* No Temperature Data	Spawning and Rearing Temperature Impaired	Potential Spawning and Rearing* Temperature Impaired	No Habitat	Spawning and Rearing
Rice Fork Tributaries (downstream to upstream)												
Packsaddle Creek (inundated by Lake Pillsbury)	0.0	0	0	0	0	0	0.2	0	0	0	0	0
Unnamed Tributary to Packsaddle Creek	2.9	0	0	0	0	0	0.3	0	0	0	3.2	0
Packsaddle Creek	3.0	0	0	0	0	0	0.9	0	0	0	4.0	0
Willow Creek	3.2	0	0.6	0	0	0	1.2	0	0	0	5.0	0
Deer Creek	7.0	0	0	0.1	0	0	0	0	0	0	7.2	0
Salt Glade Creek	1.3	0	0	0	0	0	0	0	0	0	1.3	0
Bevans Creek	1.5	0	2.1	0	0	0	0	0	0	0	3.5	0
Bear Creek	3.6	5.8	0	0	0	0	0	0	0	0	3.6	5.8
Blue Slides Creek	2.7	1.6	0	0	0	0	0	0	0	0	0	1.6
Parramore Creek	2.2	0	0	0	0	0	2.4	0	0	0	4.6	0
Little Soda Creek	2.9	0	0	0	0	0	1.6	0	0	0	4.4	0
Rock Creek	2.6	1.2	0	0	0	0	0	0	0	0	3.8	0
French Creek	1.5	1.8	0	0	0	0	0	0	0	0	3.4	0
Salt Creek	1.6	1.8	0	0	0	0	0	0	0	0	3.4	0
Subtotal (Rice Fork Tributaries)	*36.0*	*12.2*	*2.7*	*0.1*	*0.0*	*0.0*	*6.6*	*0.0*	*0.0*	*0.0*	*47.4*	*7.4*
Lake Pillsbury Tributaries												
Mill Creek	5.6	0	0	0	0	0	0.7	0	0	0	5.9	0.3
Salmon Creek (inundated by Lake Pillsbury)	0	0	0	0	0	0	0	0	0	0	0	1.6
Salmon Creek	4.3	0	0	0	0	0	0	0	0	0	0	2.7
Smokehouse Creek (inundated by Lake Pillsbury)	0	0	0	0	0	0	0	0	0	0	0	1.4
Smokehouse Creek	7.8	0	0	0	0	0	3.0	0	0	0	5.7	3.4
Subtotal (Lake Pillsbury Tributaries)	*17.6*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*3.7*	*0.0*	*0.0*	*0.0*	*11.6*	*9.4*
Grand Total (Miles)	**119.6**	**19.5**	**4.4**	**0.7**	**6.5**	**3.2**	**10.3**	**13.8**	**25.1**	**6.7**	**153.4**	**49.2**

* Potential habitat if some passage occurs at Bloody Rock Rough.



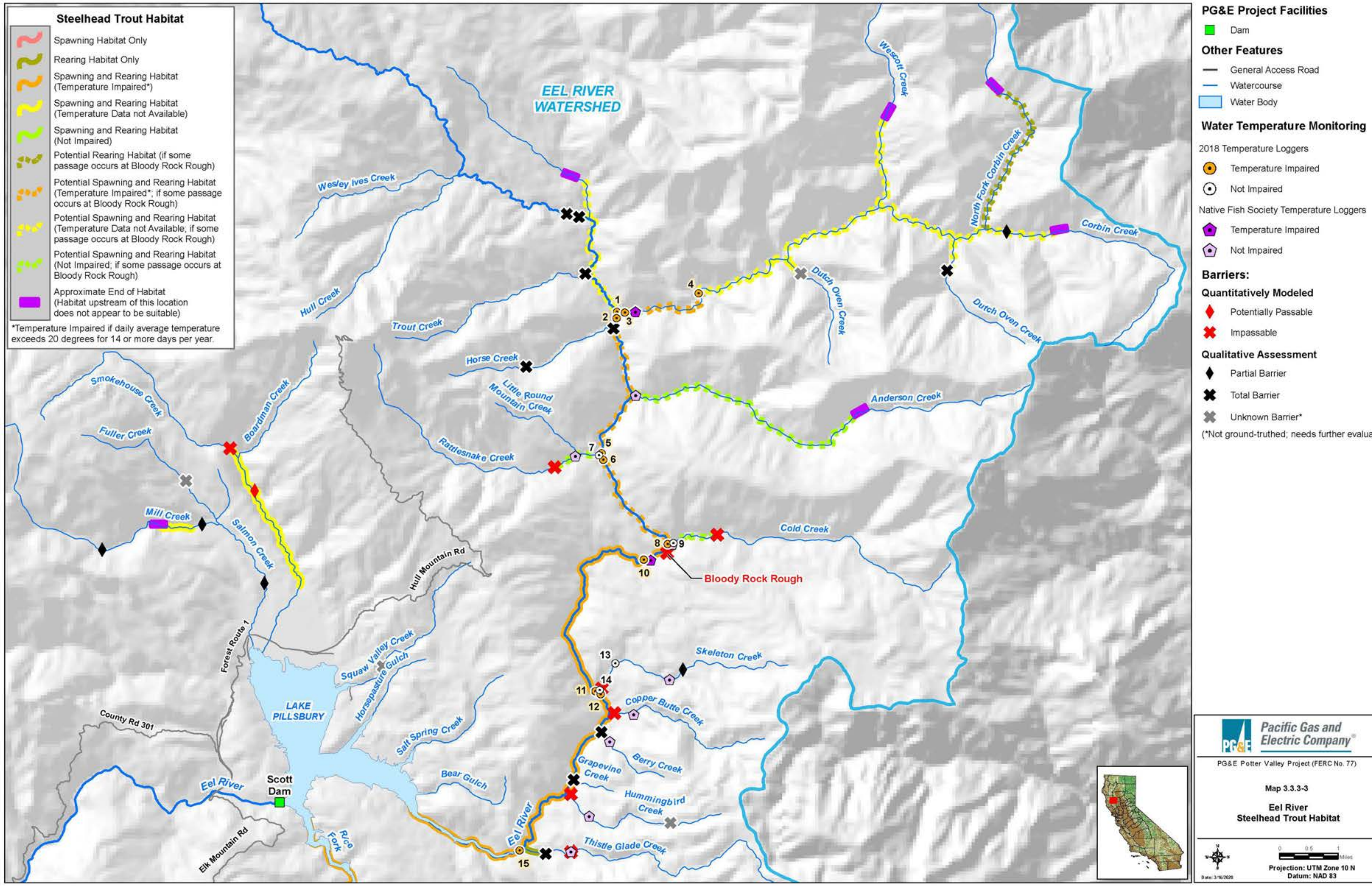
Map 3.3.3-1. **Eel River Chinook salmon habitat (Source: PG&E 2019c [2018 Relicensing Surveys]).**

This Page Intentionally Left Blank



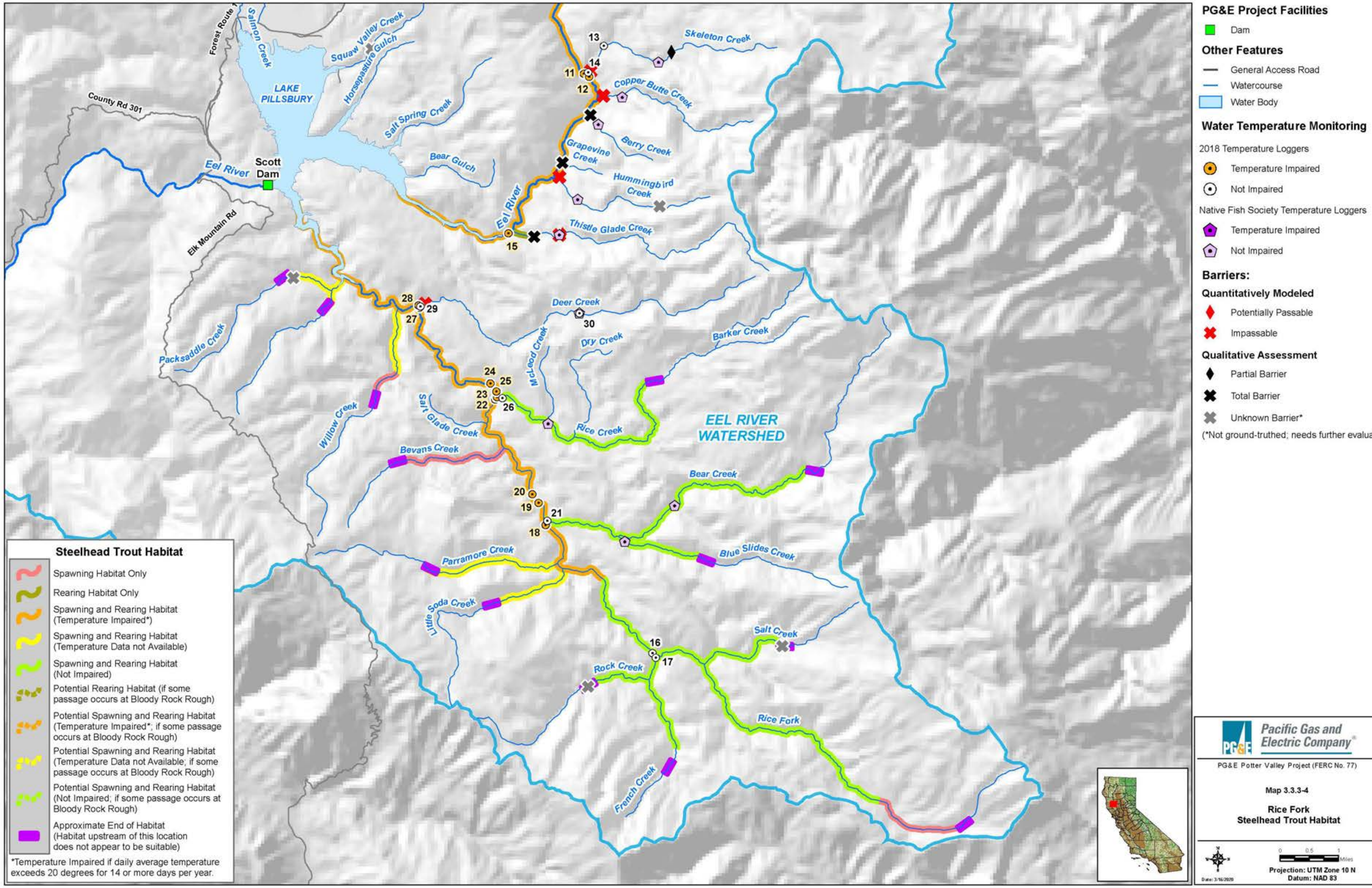
Map 3.3.3-2. Rice Fork Chinook salmon habitat (Source: PG&E 2019c [2018 Relicensing Surveys]).

This Page Intentionally Left Blank



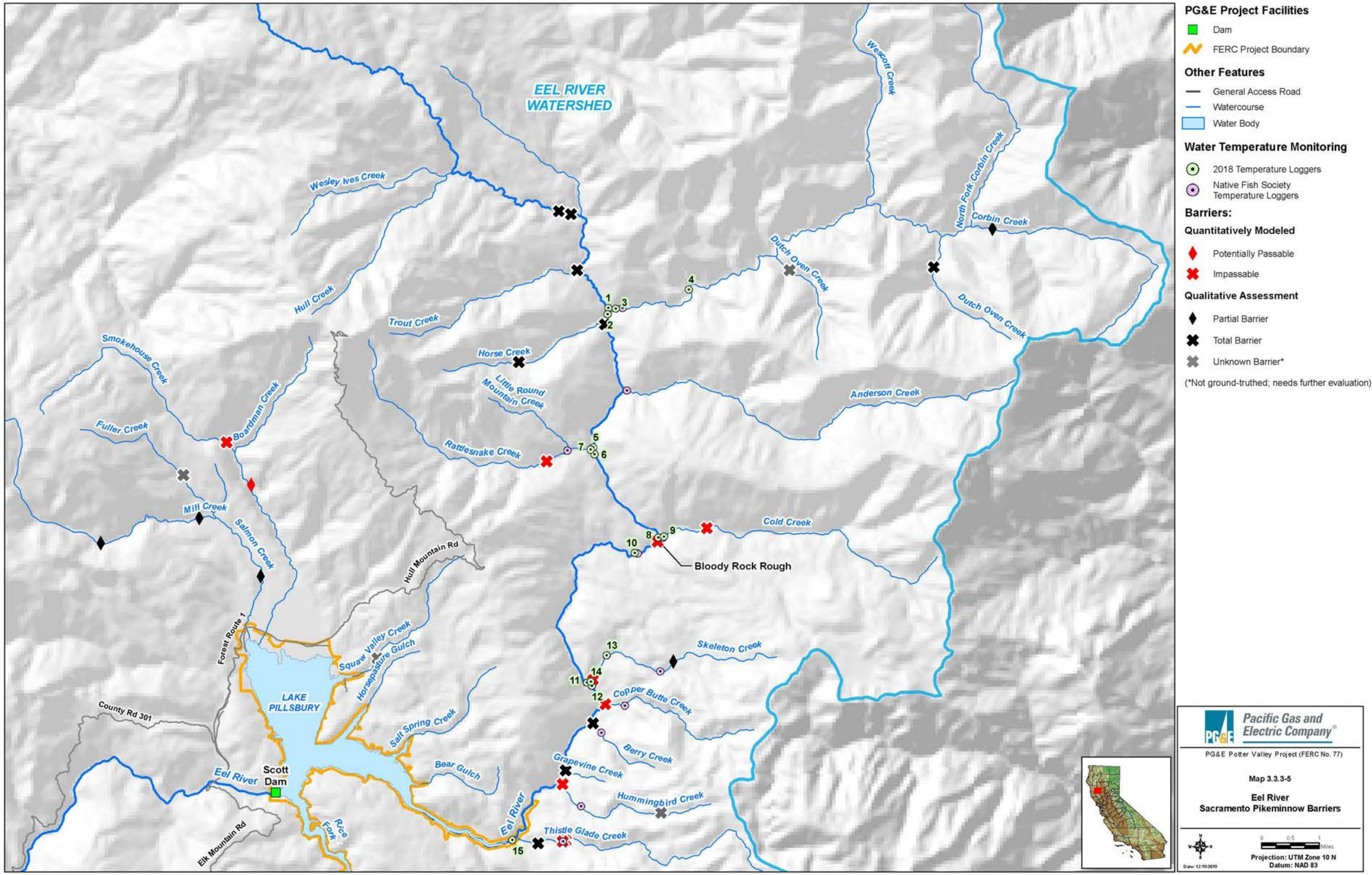
Map 3.3.3-3. Eel River steelhead trout habitat (Source: PG&E 2019c [2018 Relicensing Surveys]).

This Page Intentionally Left Blank



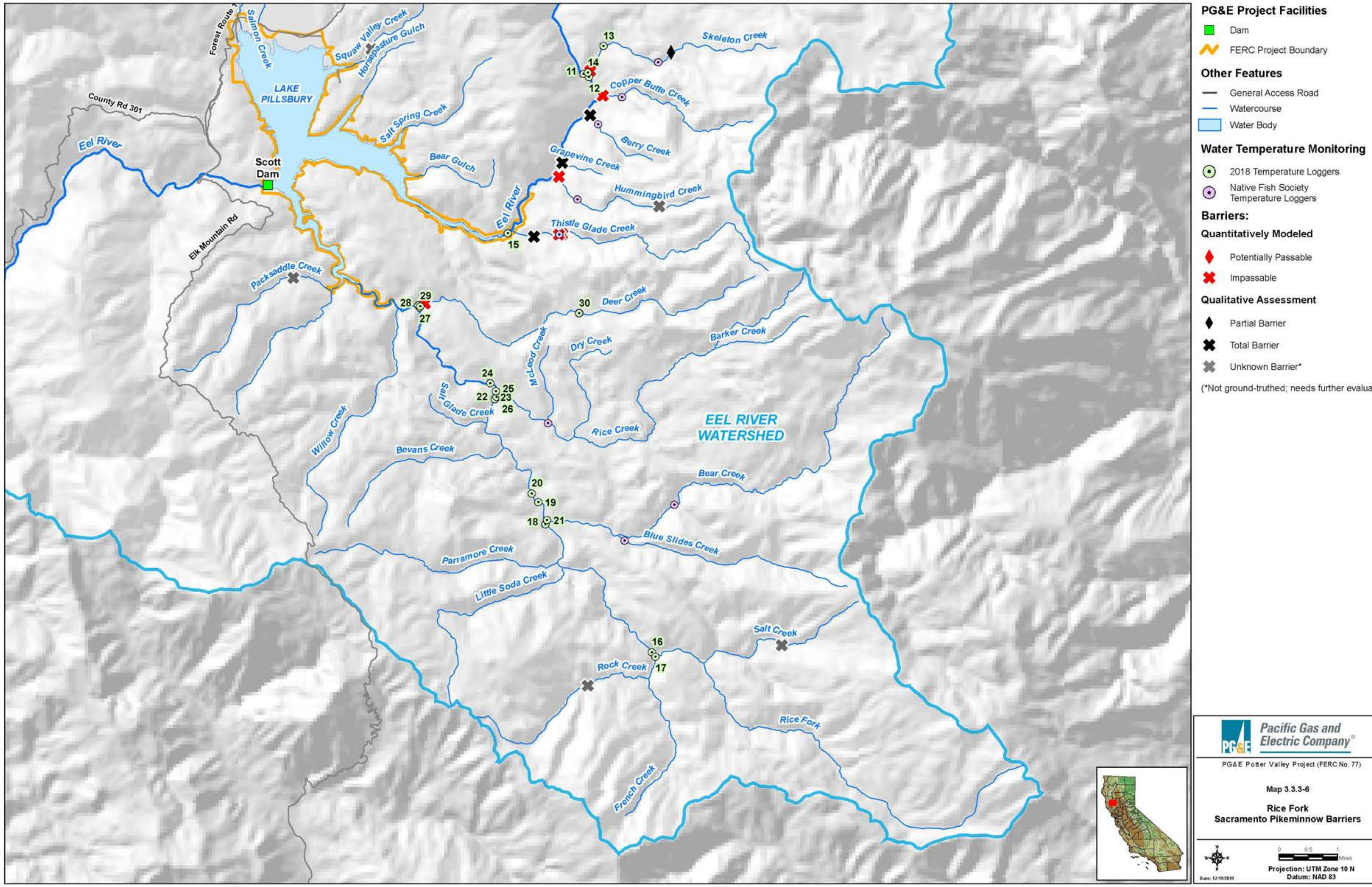
Map 3.3.3-4. Rice Fork steelhead trout habitat (Source: PG&E 2019c [2018 Relicensing Surveys]).

This Page Intentionally Left Blank



Map 3.3.3-5. Eel River Sacramento pikeminnow barriers (Source: PG&E 2019c [2018 Relicensing Surveys]).

This Page Intentionally Left Blank



Map 3.3.3-6. Rice Fork Sacramento pikeminnow barriers (Source: PG&E 2019c [2018 Relicensing Surveys]).

This Page Intentionally Left Blank

No downstream fish passage facilities exist at Scott Dam; however, when water spills over the dam, there is potential for downstream fish passage. When water is not spilling over the dam, water is released through the low-level outlet (i.e., needle valve). Movement of fish into the low-level outlet is expected to be very limited based on surveys at other reservoirs that show very low fish densities at the depth of low-level outlets (Placer County Water Agency 2011; Nevada Irrigation District and PG&E 2011).

Cape Horn Dam

Cape Horn Dam consists of a concrete gravity overflow spillway section centered on the Eel River and an earth-fill section on river right. The concrete gravity section is roughly 283 ft. long. The maximum height of the dam is approximately 63 ft. The dam also features a fish exclusion barrier downstream of the dam toe within the concrete gravity section and an adjoining "fish hotel," a large concrete structure that acts as the downstream intake to a pool-and-weir-type fish ladder that ascends through bedrock up the left abutment of the dam, exiting into VAFS (Figure 3.3.3-1).

Upstream Fish Passage

The Cape Horn Dam Fish Ladder was completed in 1909. The ladder allows anadromous fish access to the roughly 12 mi. of mainstem Eel River between Cape Horn and Scott dams and tributary habitats. Soon after the fish ladder was constructed, the California Department of Fish and Wildlife (CDFW) recognized that the design presented passage difficulties to migrating fish. The first ladder modifications took place in 1915. In 1962, additional modifications were made to increase ladder bay depth to a minimum of 3 ft., lengthen the bays, and reduce jump height between bays from 18 to 12 inches (in.).

In 1987, major modifications were made to the fish ladder as specified in FERC Article 40 opinion 187. The modifications included improving the entrance by adding a fish guidance weir and the fish hotel, which provides an attraction flow of approximately 100 cfs at the ladder entrance. The modifications were intended to help alleviate confusing patterns of attraction flow and guide fish to the ladder entrance. The weirs separating ladder bays were also widened to increase the ladder flow capacity. The upper ladder bays were changed from a pool-and-weir configuration to submerged orifices, to improve passage with varying water surface elevations in Van Arsdale Reservoir (SEC 1998). After the 1987 modifications, the average time it took for Chinook salmon that arrived in the pool below the dam to enter the ladder was reduced to 0.6 hours compared to 12.8 hours prior to the modifications (SEC 1998).

During high-flow events (e.g., 2017 and 2019), the fish hotel is potentially overtopped and sediment/woody debris can fill the lower ladder and fish hotel. In 2020, PG&E completed modifications to the fish hotel that included installing steel sediment exclusion doors over the bays of the fish hotel that can be closed immediately before high-flow events to help prevent bedload and wood debris from entering the facility.

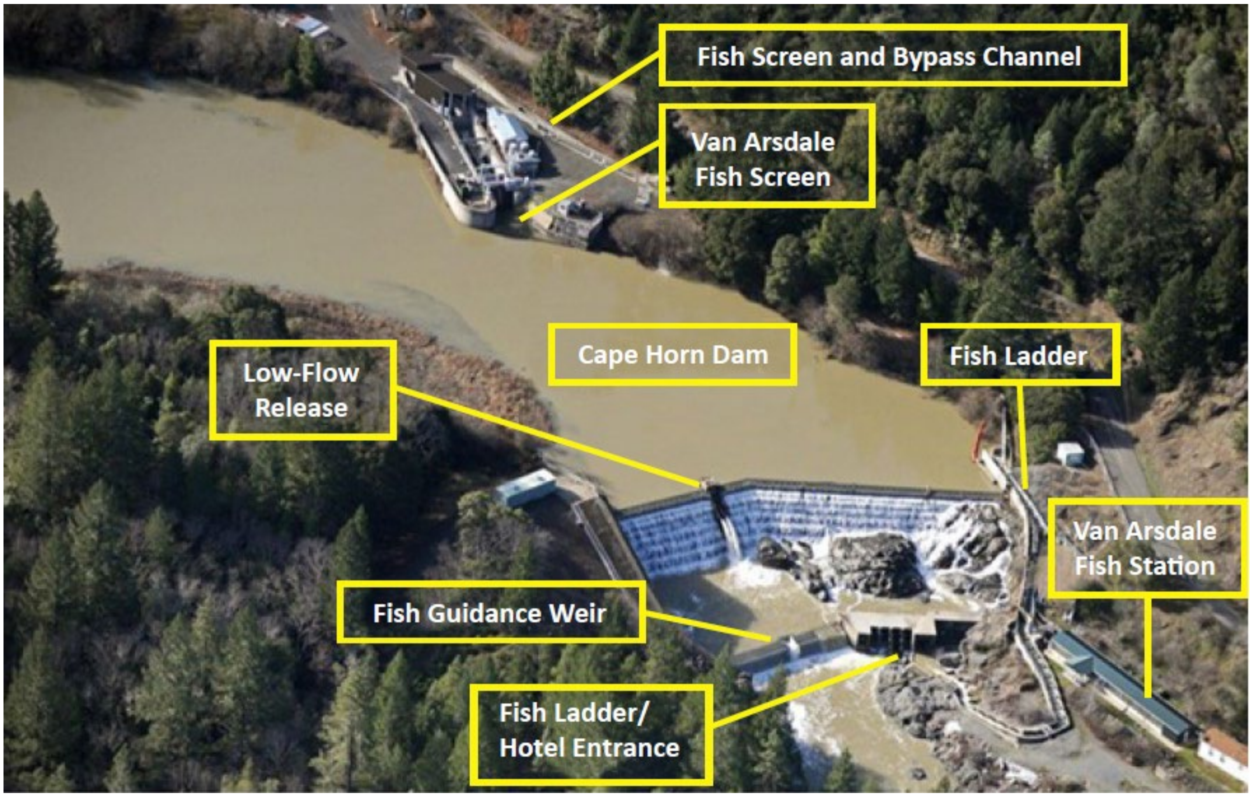


Photo Credit: Park Steiner, Steiner Environmental Consulting

Figure 3.3.3-1. Cape Horn Dam and Van Arsdale fish screen, fish ladder, and Van Arsdale Fish Station.

CDFW personnel have noted that when ladder flow drops below 9.8 cfs, a migration barrier is created at the submerged orifice of the uppermost ladder pool. Maintaining ladder flows above 9.8 cfs or installing restrictor baffles at each orifice alleviates this problem. Flows higher than 12 cfs can create overflow problems at the entrance to the ladder, especially when debris loads are high.

A collaboration between USFWS, CDFW, PG&E, and Dr. Stewart Reid (Western Fishes – Lamprey Program) has improved Pacific lamprey passage at the ladder. Pacific lamprey (a lamprey species that is migratory most seasons of the year) are not well adapted to navigating pool-and-weir ladders (e.g., high velocities and 90-degree angles at the top and sides of the weir are difficult for lamprey to traverse). Prior to the recent experimental work, less than 50 percent of migrating lamprey were thought to successfully migrate pass Cape Horn Dam, and median travel time from the bottom of the ladder to the top, when successful, was on the order of 1 month (Stillwater Sciences 2014; S. Reid, pers. comm., 2017).

Experimental work at the ladder to improve lamprey passage has included rounding the tops and vertical sides of the weirs, providing gaps under the weir boards, and providing U-shaped fittings on the weirs, as well as installing independent tube routes bypassing the fish ladder (S. Reid, pers. comm., 2017). In 2016, a flexible 4-in. PVC pipe was installed to provide an alternate passage route and bypass the ladder completely. The pipe was installed from the lower entry chamber ("fish hotel"), past the ladder, and into Van Arsdale Reservoir. Initial testing of this pipe has shown dramatic improvement in passage success (> 1,000 lamprey passing) and passage time (on the order of 3 hours). Experiments in 2017 intended to enhance access to the tube at the entrance by limiting passage into the pool-and-weir ladder (S. Reid, pers. comm., 2017). According to staff at both PG&E and CDFW, this installation is working well, and Pacific lamprey ascend the ladder in a matter of hours (Stillwater Sciences et al. 2021).

Downstream Passage

Downstream passage of fish (e.g., juvenile salmonids and steelhead kelt) at Cape Horn Dam occurs, but the structure has limitations that can create unsafe passage at low and intermediate flows. Passage at low flows is through the low-flow release structure (capacity 124 cfs) at the center of the dam, which has a significant drop (26.6 ft.) and through the fish ladder at river left. At intermediate and high flows, downstream passage also occurs over the dam and over the downstream steps of the dam (Figure 3.3.3-2). At intermediate flows, water depth over the downstream steps of the dam is likely insufficient to cushion fish. Downstream passage also occurs at the Van Arsdale fish screen. Fish entering Van Arsdale fish screen system above Cape Horn Dam are moved from the screen via an Archimedes screw pump and put into a fish return channel that exits into the fish ladder.

In 2021, fish passage improvements at Cape Horn Dam and the Van Arsdale Diversion were studied further to assess the primary objectives and fish passage performance criteria, develop conceptual design alternatives for fish passage improvements, and evaluate the feasibility of the conceptual alternatives (McMillen 2021). The technical memorandum resulting from this study identified four alternatives that had the potential to meet the project goals; however, no fish passage improvements have occurred because of this study.

Figure 3.3.3-2. Cape Horn Dam at low flow (left) and high flow (right).

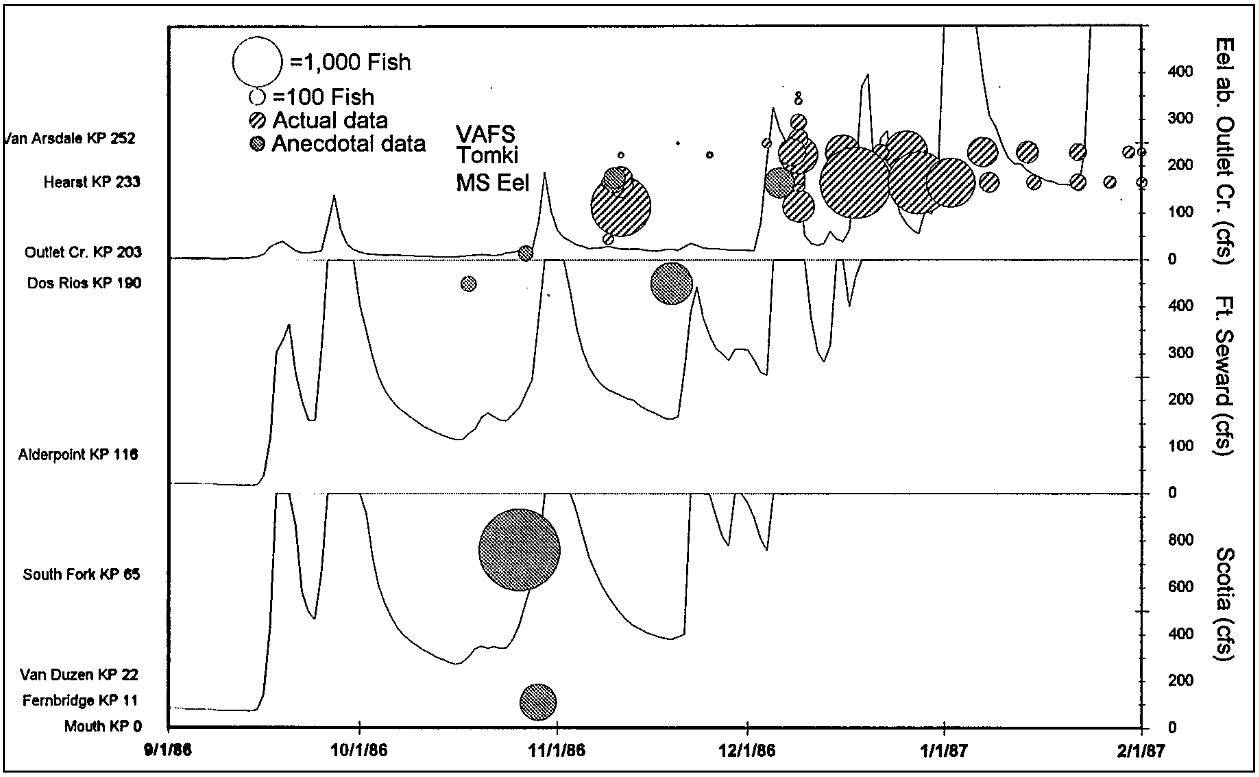
Eel River

Mainstem

The most significant obstacles to adult fish passage in the Eel River downstream of Cape Horn Dam are shallow riffles, defined in VTN (1982) as "critical riffles." VTN (1982) examined the relationship between successful adult Chinook salmon and steelhead passage and flow in the Eel River at five critical riffles. The assessment of critical riffle passage was one factor in the development of the variable flow schedule (Article 38) of the 1983 Project license, which provided for minimum flow releases up to 100 cfs and supplemental block water releases, which CDFW could request to supplement passage.

A 10-year monitoring study to assess the adequacy of the Article 38 flow schedule (SEC 1998) evaluated: (1) the flow required for fish to pass the most limiting critical riffle (above Garcia Creek); (2) the timing of upstream movements of Chinook salmon and steelhead; and (3) accretion flows during adult upstream migration. At the critical riffle above Garcia Creek (Hearst Riffle), it was determined that 140 cfs provided 12 continuous feet of usable width (0.6 ft. deep), which exceeded the minimum passage requirements identified by VTN (1982) of 4 continuous feet with depth of 0.6 ft. Timing for steelhead upstream migration in the study area was determined to be late December to April (peak February or March), and timing of Chinook salmon upstream migration was determined to be late October to January. Figure 3.3.3-3 shows an example of migration timing related to season and flow. Based on an estimated average accretion of 16 cfs or 38 cfs (90 percent and 75 percent exceedance, respectively) during November to January, it was determined that a release of 124 cfs (140 minus 16 cfs) at Cape Horn Dam would provide passage 90 percent of the time, and a release of 102 cfs (140 minus 38 cfs) would provide adequate passage 75 percent of the time (SEC 1998).

The current RPA minimum flows are intended to allow for adequate passage flows at the critical riffle above Garcia Creek. During the December to March period, the minimum RPA flow from Cape Horn Dam has a floor of 100 cfs and a cap of 140 cfs; however, the floor can drop to 25 cfs when there are exceptionally low inflows to Lake Pillsbury (NMFS 2002).



Source: SEC 1998: Figure 5.3-1

Figure 3.3.3-3. Magnitude and timing of adult Chinook salmon migration through the Eel River in relation to mean daily discharge in 1986/1987 (bubble area is proportional to the number of fish reported).

Tributaries

Eel River tributaries that flow into Lake Pillsbury and the Eel River from Scott Dam to the Middle Fork Eel River were surveyed in 2018 as part of PG&E's relicensing efforts. Seventeen tributaries were selected based on their availability of anadromous fish habitat. Thirteen of the selected tributaries are downstream of Lake Pillsbury: Middle Fork Eel River, Outlet Creek, Indian Creek, Fish Creek, Twin Bridges Creek, Salt Creek, Garcia Creek, Thomas Creek, Tomki Creek, Bucknell Creek, Dashiell Creek, Benmore Creek, and Soda Creek (RMs are shown in Table 3.3.3-1). Four tributaries flow into Lake Pillsbury: Salmon Creek, Smokehouse Creek, Eel River, and Rice Fork (PG&E 2019e). Tributaries were surveyed to identify potential tributary access issues related to water surface elevations at Lake Pillsbury or Eel River discharge based on the geomorphology at the tributary confluence. Most tributaries surveyed were dry or contained very small amounts of water. Exceptions include the Middle Fork Eel River and the Eel River and Rice Fork inflows to Lake Pillsbury. No access issues related to water surface elevations at the mouth were present at any of the tributaries surveyed (PG&E 2019e).

Critical riffle passage surveys were conducted in October and December of 2018 from Scott Dam to the Middle Fork Eel River (PG&E 2019e). Three critical riffles were selected, surveyed, mapped, and analyzed. The sites were selected because they represented the most limiting critical riffles in the Eel River for upstream fish passage (even more limiting than the critical riffles historically studied or mentioned above). The three critical riffles included a riffle below Outlet Creek at RM 125.72, a riffle downstream of Salt Creek at RM 142.95, and a riffle downstream of Tomki Creek at RM 152.5. The preliminary data indicated that at a flow of approximately 36 cfs, riffles were likely not suitable for passage, and at approximately 150 cfs flow, the critical riffle below Salt Creek barely met previous licensing passage criteria (this was the most limiting riffle) (PG&E 2019e).

Stream inventories have identified additional fish passage barriers related to culverts on lower mainstem Eel River tributaries, including Adams, Atwell, West Fork Howe, Dean, Nanning, Palmer, Miller, Cummings, Jameson, and Oils creeks, Wolverton Gulch, and Rohnerville Road (California Department of Fish and Game [CDFG] 2010; California Trout et al. 2024).

Sedimentation and connectivity issues caused by dry reaches in the Eel River create additional fish passage barriers. In the lower mainstem Eel River, stranding of Chinook salmon has been observed at the Van Duzen River confluence of the Eel River. Gravel extraction altered the channel of the Van Duzen River until 1996, widening the channels and creating a shallow, braided reach unsuitable for fish passage (CDFG 2010). The lower 4 mi. of the Van Duzen River have purposefully been blocked to salmonids since 2003 to prevent stranding. Seasonal high-gradient "barrier" culverts are installed to ensure migrating adult salmonids are not stranded in the shallow waters that occur before sufficient flows allow for upstream passage. Additional flow-dependent barriers have been noted upstream in the South Fork Eel River above Rattlesnake Creek (Trush 1991) and in the upper Eel River at Hearst Riffle (VTN 1982).

Temporary small rock dams constructed on Eel River tributaries (e.g., Price Creek) to facilitate water diversion block upstream and downstream migration of juvenile salmonids and impede salmonid spawning. Large debris accumulations in streams can sometimes cause fish passage barriers and have been observed in CDFW stream inventories (CDFG 2010; Taylor 2000). Generally, the lower mainstem Eel River has smaller substrates, lower shear stress hydraulic forces, greater fine sediments, and shallower pools than the upstream mainstem reaches. With climate change and earlier onset of low river flows, the lower mainstem is expected to become increasingly important and more utilized for green sturgeon spawning and holding habitat (Stillwater Sciences and Wiyot Tribe 2017).

Instream Flow

River flows and instream flow requirements for the Project have varied over four distinct time periods:

- Historical period (pre-1979), representing operations under the FERC license issued in 1922[2] prior to increased instream flow releases below Cape Horn Dam for relicensing/environmental purposes in 1979.

[2] The original license for the Project was issued effective April 15, 1922, and expired on April 14, 1972. From 1972 to 1983, the Project operated on annual licenses during the extended relicensing period. FERC issued a new license for the Project in 1983, which was amended in January 2004.

- Transition period (1979–2006), representing operations under various modifications of instream flow releases below Cape Horn Dam for pre-relicensing study flows (1979), relicensing study flows (including an instream flow study) (1980–1983), 1983 license flow requirements (including a 10-year monitoring study) (1984–2003), and 2004 license amendment flow requirements including RPA flows (2004–2006).
- NMFS's RPA (2007–2022), representing operations after reinterpretation of the RPA. Between 2013 and 2022, variances were required in 7 out of the 10 years due to inadequate water supply and the inability to meet RPA flows.
- Existing conditions (2023 to present), representing the 2023 and 2024 temporary variance and pending license amendment flows.

Under existing Project operations, instream flows include minimum flows, warm surface water releases, and block water (i.e., a volume of water used by fisheries agencies adaptively to enhance aquatic habitat) as specified by the NMFS (2002) RPA for the Project and incorporated into the FERC license amendment (FERC 2004) (see Section 3.3.1). Minimum instream flows are specified in the Eel River below Scott Dam and below Cape Horn Dam. The flow requirements have attempted to mimic the pattern and timing of the natural hydrograph in the Upper Eel River Watershed. Due to repeated years of drought conditions in 2013–2022, and seismic safety concerns identified at Scott Dam in 2023 that restrict storage in Lake Pillsbury, minimum flow requirements have been modified by variances that were requested by PG&E and approved by FERC (2013, 2015, 2016, 2020, 2021, and 2022–2024). A license amendment that reduces minimum flow requirements in the East Branch Russian River is pending.

Aquatic Community

Algae

Reports of nuisance blooms, algal scums, animal illnesses, and, on occasion, human health issues within the North Coast region since 2015 prompted sampling for anatoxin-a (cyanobacterial toxin) at several sites in the Eel River, including Lake Pillsbury. Sampling conducted by PG&E detected anatoxin-a in Lake Pillsbury between late August and mid-October 2016. By late October, anatoxin-a was no longer detected at sites sampled in Lake Pillsbury. Anatoxin-a was detected in the lower reaches of the Eel River, South Fork Eel River, and Van Duzen River in 2015 (Bouma-Gregson et al. 2018). During 2018 water quality studies, cyanobacteria toxins including anatoxin-a were not detected in the Eel River downstream of Scott Dam to Van Arsdale Reservoir (PG&E 2019d). A more detailed discussion of cyanobacterial toxins is provided in Section 3.3.2.

Benthic Macroinvertebrates

Benthic macroinvertebrate (BMI) sampling has not been historically conducted in the Eel River below Scott Dam. CDFW's Aquatic Bioassessment Lab and the MNF have previously collected BMI samples from several tributaries to the Eel River, but these are not affected by current Project operations (State Water Resources Control Board [SWRCB] 2016).

Aquatic Molluscs

The Eel River from Scott Dam to the Eel River estuary is within the historical range of the Western pearlshell mussel and the California floater (Howard et al. 2015a). Western pearlshell mussels were observed by PG&E during 2018 field surveys in the Eel River upstream of Van Arsdale Reservoir and in the East Branch Russian River (PG&E 2019b), and both species are believed to be extant in the Eel River Watershed (Howard et al. 2015a). California floater are known to be present in the South Fork Eel River (Howard and Cuffey 2003). Neither species is listed by the state of California as threatened or endangered (California Natural Diversity Database [CNDDB] 2024). Both species are listed by CDFW as “special animals” (i.e., special-status species) (CNDDB 2024); USFS classifies the California floater as a Forest Service Sensitive (FSS) species in several California forests, although not in the MNF (CNDDB 2024; USFS 2013).

The non-native invasive bivalve *Corbicula fluminea* (i.e., Asian clam) was observed by PG&E during 2018 surveys below Scott Dam to the Middle Fork Eel River confluence, in addition to past incidental observations from 2010 to 2016 (Catenazzi and Kupferberg 2013; Catenazzi and Kupferberg, pers. comm., 2017; P. Kubicek, pers. comm., 2017; PG&E 2017g, 2019b). The most prominent effects of Asian clams in North American rivers are that at high densities they can alter benthic substrates and outcompete native benthic taxa (USFWS 2011).

Fish Community

Sixteen native and eight non-native fish species are present or may occur in the Eel River within the study area (Table 3.3.3-3). Historical studies of the fish community in the Eel River below Scott Dam primarily focused on native steelhead, Chinook salmon, and introduced Sacramento pikeminnow. Additional studies have been conducted on Pacific lamprey swimming speed and passage at Cape Horn Dam (e.g., Reid and Goodman 2016), native coho salmon, and green sturgeon. Focal fish species considered in the Eel River Restoration and Conservation Program include Chinook salmon, coho salmon, steelhead, Pacific lamprey, and green sturgeon (California Trout et al. 2024). A summary of population data and other information available for each species is provided below.

Table 3.3.3-3. Fish species known to occur or potentially occurring in the Eel River from Scott Dam to the Ocean, including the Eel River estuary.

Family	Common Name	Scientific Name	Status	Presence by Reach			
				Scott Dam to Van Arsdale Reservoir	Cape Horn Dam to Middle Fork Eel River	Middle Fork Eel River to Eel River Estuary	Eel River Estuary
Salmonidae	Steelhead (northern California Coast DPS, winter and summer-run)[a]	*Oncorhynchus mykiss*	N, FT, SE, SSC	X	X	X	X
	Chinook Salmon (California coastal ESU, fall-run)	*Oncorhynchus tshawytscha*	N, FT, SSC	X	X	X	X
	Coho Salmon (Southern Oregon/Northern California Coast ESU)	*Oncorhynchus kisutch*	N, FT, ST		X[b]	X	X
	Coastal cutthroat trout	*Oncorhynchus clarkii clarkii*	N, SSC,			X	X
Acipenseridae	Green sturgeon (Northern DPS)[c]	*Acipenser medirostris*	N, SSC[d]			X[e]	X
	White sturgeon	*Acipenser transmontanus*	N, SSC[f]				X[g]
Gobionellidae	Tidewater goby	*Eucyclogobius newberryi*	N, FE, SSC				X
Petromyzontidae	Pacific lamprey	*Entosphenus tridentatus*	N, SSC, FSS (MNF)	X	X	X	X
	Western brook lamprey[h]	*Lampetra richardsoni*	N, SSC, FSS (MNF)	X	X	X	
	Western river lamprey	*Lampetra ayresii*	N, SSC	X[i]	X[i]	X[i]	
Osmeridae	Pacific eulachon (Southern DPS)	*Thaleichthys pacificus*	N, FT, SSC			—[j]	—[j]
	Longfin smelt	*Spirinchus thaleichthys*	N, FPE, ST			X[k]	X
Catostomidae	Sacramento sucker	*Catostomus occidentalis*	N	X	X	X	X[l]
	Humboldt sucker	*Catostomus occidentalis humboldtianus*	N			X	
Cottidae	Sculpin spp.	*Cottus* spp.	N	X	X	X	X
	Prickly sculpin	*Cottus asper*	N		X	X	X
Embiotocidae	Shiner surfperch	*Cymatogaster aggregate*	N				X
	Redtail surfperch	*Amphistichus rhodoterus*	N				X
Gasterosteidae	Stickleback	*Gasterosteus* spp.	N			X	X[l]
Pleuronectidae	Starry flounder	*Platichthys stellatus*	N				X
Clupeidae	American shad	*Alosa sapidissima*	I				X
Cyprinidae	Northern coastal roach	*Hesperoleucus venustus navarroensis*	I, SSC	X	X	X	
	California roach	*Lavinia symmetricus*	I	X	X	X	
	Sacramento pikeminnow	*Ptychocheilus grandis*	I	X	X	X	
	Golden shiner	*Notemigonus crysoleucas*	I	X			
	Green sunfish	*Lepomis cyanellus*	I	X	X	X	

Family	Common Name	Scientific Name	Status	Presence by Reach			
				Scott Dam to Van Arsdale Reservoir	Cape Horn Dam to Middle Fork Eel River	Middle Fork Eel River to Eel River Estuary	Eel River Estuary
Centrarchidae	Bluegill	*Lepomis macrochirus*	I	X	X		
	Largemouth bass	*Micropterus salmoides*	I	X	X		
Ictaluridae	Brown bullhead	*Ameiurus nebulosus*	I	X	X	X	

Sources: Adams et al. 2002; Cannata and Hassler 1995; CDFG 2010; CDFW 2024a; iNaturalist 2024; Monroe et al. 1974; Moyle 2002; Murphy and De Witt 1951; PFMC 2024a, 2024c, and 2023; Puckett 1976, 1977

[a] Several non-native strains of rainbow trout have been planted into Project waters or waters that drain into the study area.
[b] Primarily considered a migration corridor for adult and juvenile coho salmon entering and leaving Outlet Creek but may serve as winter rearing habitat.
[c] The southern DPS of green sturgeon is present in the marine environment and is discussed further in Section 3.3.18.
[d] The Eel River population is part of the Northern DPS, which is not federally or state listed.
[e] Adams et al. (2002) report "Juvenile green sturgeon were captured in the Eel River in traps at Rio Dell (rkm 20) and Dos Rios (rkm 191) during the period from 1967 to 1970 (Puckett 1976)." However, green sturgeon catches are not listed in the Dos Rios trapping results tables (Tables 8–10) in Puckett (1976).
[f] White sturgeon are candidate species for listing as threatened under CESA.
[g] Species were identified in historical documents in the estuary. The current species assemblage is not documented.
[h] Western brook lamprey is part of a species complex that may include other closely related, non-parasitic *Lampetra* species. Western brook lamprey are present in the Eel River, including above Lake Pillsbury (Moyle 2002).
[i] A single adult western river lamprey has been captured at Cape Horn Dam (Moyle 2002).
[j] Eulachon were likely historically present in the lower Eel River but are probably extinct from the river (Yoshiyama and Moyle 2010) and there is no critical habitat for eulachon in the Eel River (NMFS 2011).
[k] Longfin smelt have been observed in the estuary and in the lower Eel / Van Duzen Rivers (CDFG 2009).
[l] Historical observations and captures in the Eel River estuary by Puckett in 1973–1974 and Cannata and Hassler in 1994–1995 (CDFG 2010).

Notes:
DPS = distinct population segment
ESU = evolutionarily significant unit
FE = Federally listed as Endangered
FPE = Federally Proposed Endangered
FSS = Forest Service Sensitive Species
FT = Federally listed as Threatened
I = Introduced species
MNF = Mendocino National Forest
N = Native species
SE = State listed as Endangered
SSC = California Species of Special Concern
ST = State listed as Threatened

Salmonids

Long-term monitoring data for steelhead (1922 to present) and Chinook salmon (1946–1947, 1950, 1955 to present) returning to VAFS are available. This is one of the longest records in the state. There has also been extensive monitoring and studies of steelhead and Chinook salmon (e.g., escapement/spawning, rearing, outmigration, pikeminnow/predator) from 1979 to the present in the Eel River (e.g., FERC relicensing 1983 and post-relicensing studies). The current distribution of coho salmon is in the cooler and more coastal tributaries to the South Fork Eel, Van Duzen, and lower Eel rivers; however, small numbers of individuals may be found in Outlook Creek and potentially other tributaries to the upper Eel River (California Trout et al. 2024). A small population of coho salmon in Outlet Creek at the lower end of the study area uses the mainstem Eel River as a passage corridor. Figure 3.3.3-4 through Figure 3.3.3-7 show Chinook salmon, winter-run steelhead, summer-run steelhead, and coho distribution in the Eel River and connected water bodies, respectively.

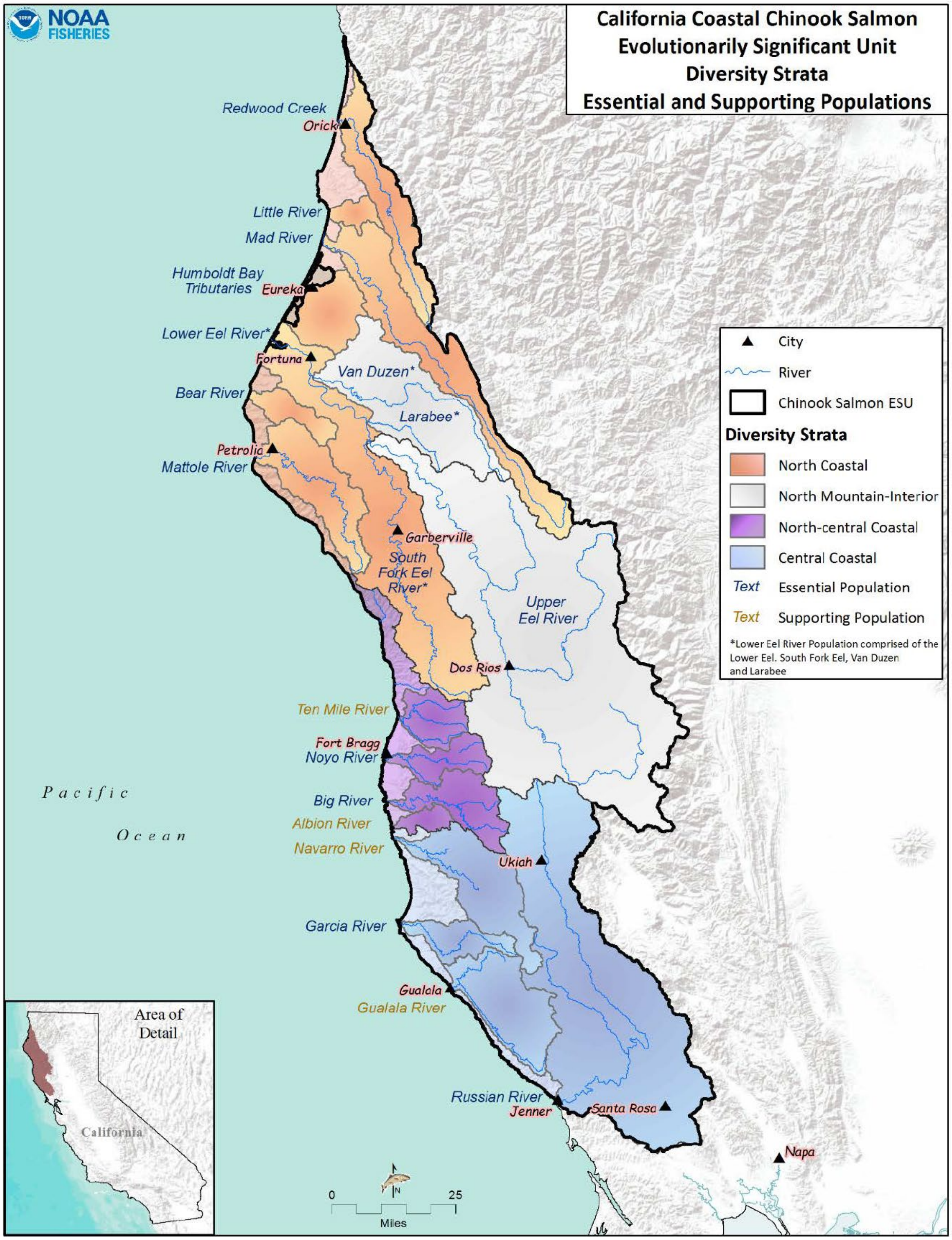
Steelhead

Winter-run steelhead have the broadest spatial distribution of anadromous salmonids in the Eel River. The distribution includes the Upper Eel River Watershed downstream of Scott Dam (mainstem and suitable tributaries) (Figure 3.3.3-5). Summer-run steelhead are primarily found in the Lower Eel River Watershed in the Van Duzen River and Middle Fork Eel River (Figure 3.3.3-6).

Lower Eel River

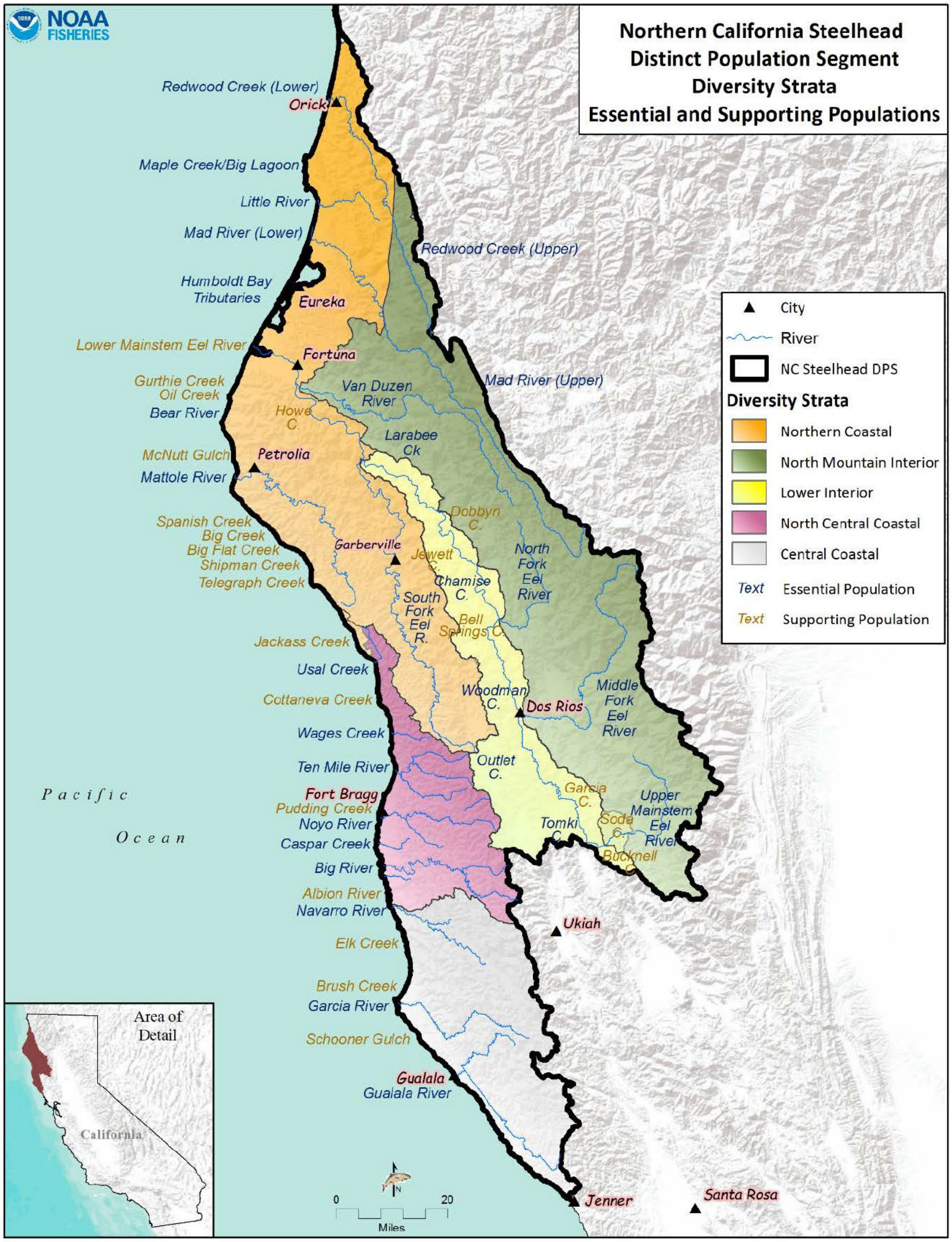
Winter-run steelhead are found throughout the lower Eel River and tributaries where suitable habitat exists (Middle Fork Eel River, South Fork Eel River, Van Duzen River, and numerous tributaries) (Figure 3.3.3-5). Summer-run steelhead in the lower Eel River watershed are primarily found in the Van Duzen River and Middle Fork Eel River (Figure 3.3.3-6). The distribution of the summer-run steelhead is restricted relative to the winter-run, due to limited availability of habitat (cold water) needed to support holding of adults during the summer (California Trout et al. 2024).

Juvenile steelhead leave the tributaries and mainstems in the major sub-watersheds and utilize the lower mainstem and the estuary to the Eel River as transitional habitat between fresh water and salt water (California Trout et al. 2024; Cannata and Hassler 1995; Puckett 1977). Juvenile steelhead have been observed year-round in the estuary, but they are most abundant in the summer and fall. The estuary serves as a holding area for adult steelhead during upstream spawning migrations (late fall into early summer). During these migrations, the estuary and rivers support a catch-and-release sport fishery for adult steelhead (CDFG 2010).



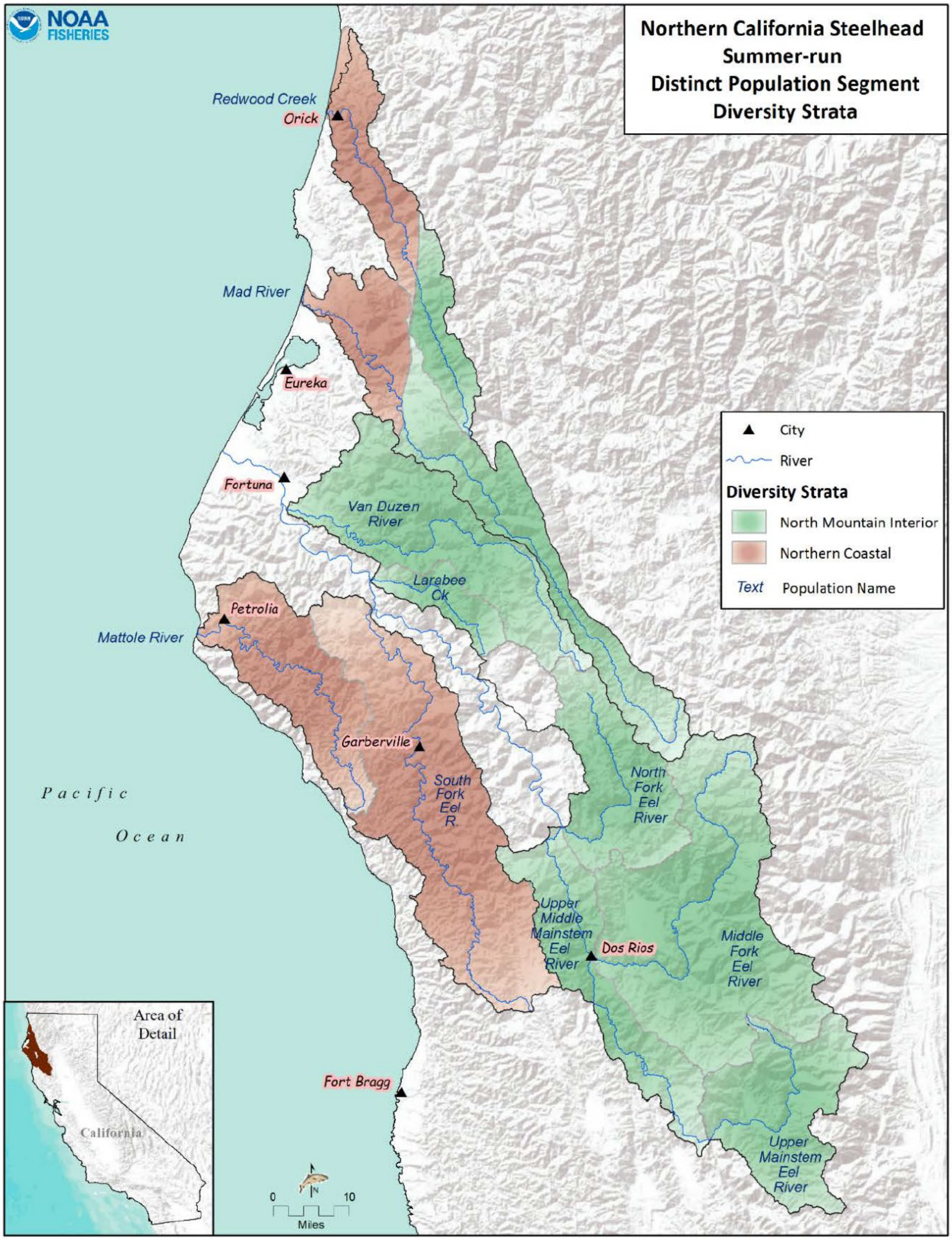
Source: NMFS 2016b

Figure 3.3.3-4. California coastal Chinook salmon ESU diversity strata and essential and supporting populations.



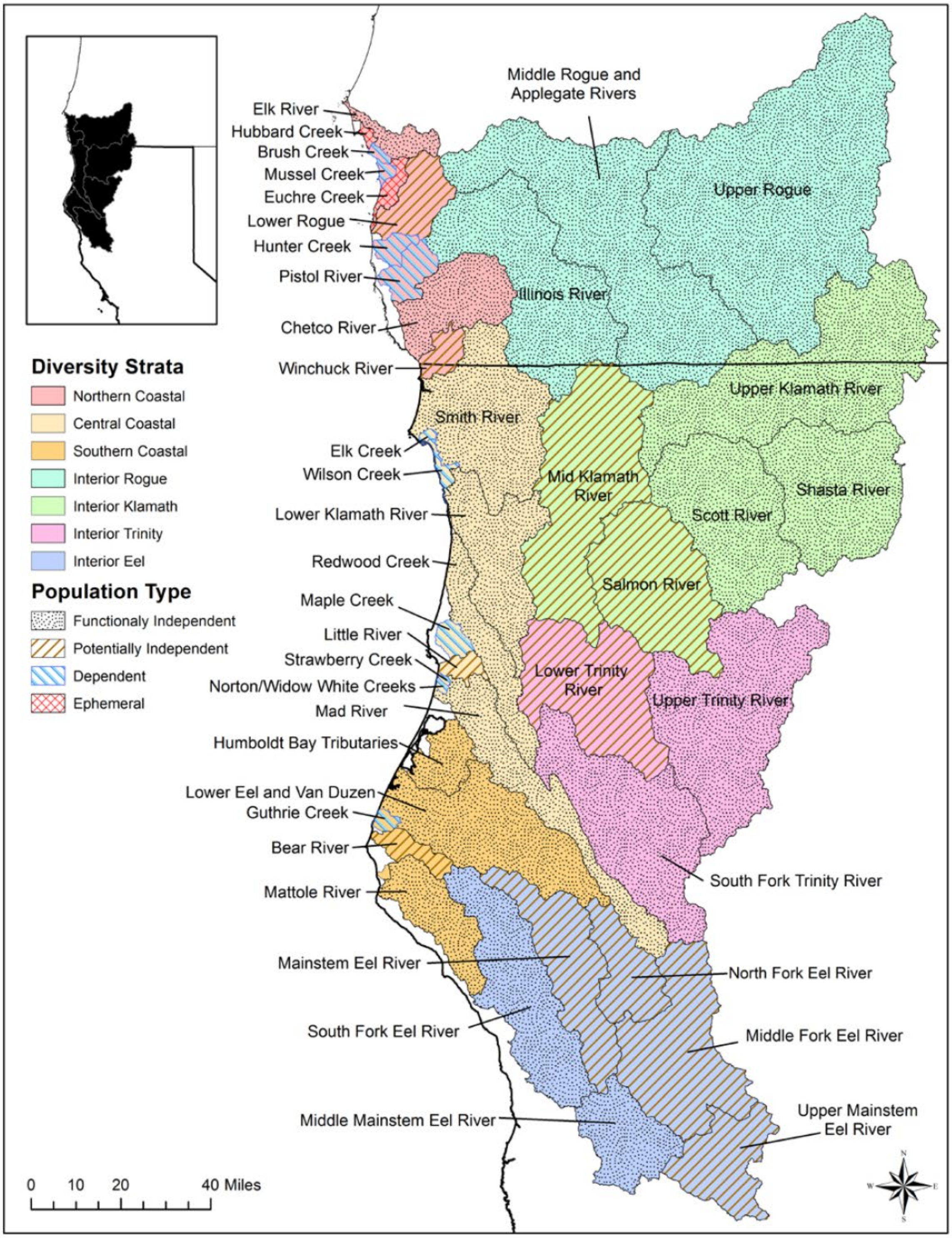
Source: NMFS 2016b

Figure 3.3.3-5. Northern California steelhead winter-run DPS diversity strata and essential and supporting populations.



Source: NMFS 2016b

Figure 3.3.3-6. Northern California steelhead summer-run DPS diversity strata.



Source: NMFS 2014a

Figure 3.3.3-7. Historical population structure of the Southern Oregon and Northern California coast coho salmon ESU, including populations and diversity strata.

Upper Eel River

Density. Key information related to steelhead in the upper Eel River portion of the study area includes the following:

- Adult steelhead numbers have declined since the 1960s.
- Spawning and rearing (e.g., over summer) exists both in the Eel River and tributaries downstream of Lake Pillsbury.
- The density of rearing steelhead in the Eel River decreases with increasing distance and associated warm-water temperatures downstream of Van Arsdale Reservoir.
- Introduced Sacramento pikeminnow densities have been high since the 1980s and are highest in the river below Van Arsdale Reservoir (e.g., below Emandal; see discussion on introduced species below), where water temperatures are more suitable for the species; however, they occur in and above Van Arsdale Reservoir, at population levels that may interfere with salmonid production. Their proliferation and competition with, and predation on, native fish species is viewed as a major obstacle to the recovery of anadromous salmonids in the Eel River Watershed.

Annual adult steelhead counts at VAFS since 1922 were frequently above 3,000 to 4,000 fish prior to approximately 1960 (Table 3.3.3-4). Since 1960, steelhead counts have typically been less than 1,000 to 2,000 fish and, in many years, less than 500 fish. Many factors are assumed to be related to the observed declines in fish numbers at VAFS and elsewhere in the watershed, including logging, road construction, livestock grazing, agriculture (both legal and illegal), introduction of invasive species, natural flood events, extended drought, and poor ocean conditions. In the late 1990s, a spike in numbers occurred, with counts in three successive years ranging from approximately 2,400 to 7,700 fish; however, the spike was heavily influenced by hatchery fish. From 2008 to 2015, steelhead counts ranged from 166 to 935 fish, with only one hatchery fish. In 2016, steelhead counts decreased to a recorded low of 59 fish. Since 2017, steelhead counts have ranged from 179 to 323, with zero hatchery fish. The "collapse" of the steelhead (and Chinook salmon) returns beginning in 1989 (during the 10-year monitoring study) was related to poor ocean conditions that affected salmonids on the West Coast (SEC 1998). Other high and low cycles in the dataset are, in part, a product of cycles in ocean productivity.

Table 3.3.3-4. Number of upstream migrating steelhead trapped annually at VAFS based on records provided by CDFW.

Season	Wild	Hatchery	Total Count
1920/21	ND	ND	ND
1921/22	ND	ND	ND
1922/23	ND	ND	3,675 [b]
1923/24	ND	ND	4,566 [b]
1924/25	ND	ND	ND
1925/26	ND	ND	ND
1926/27	ND	ND	4088 [b]
1927/28	ND	ND	4032 [b]
1928/29	ND	ND	4578 [b]
1929/30	ND	ND	ND
1930/31	ND	ND	2834 [b]
1931/32	ND	ND	3377 [b]
1932/33	ND	ND	3659 [b]
1933/34	ND	ND	3,247
1934/35	ND	ND	2,255
1935/36	ND	ND	6,310
1936/37	ND	ND	6,861
1937/38	ND	ND	3,413
1938/39	ND	ND	4,786
1939/40	ND	ND	3,889
1940/41	ND	ND	2,225
1941/42	ND	ND	ND
1942/43	ND	ND	3274 [b]
1943/44	ND	ND	3470 [b]
1944/45	ND	ND	9,528
1945/46	ND	ND	5,054
1946/47	ND	ND	4,409
1947/48	ND	ND	178
1948/49	ND	ND	2,433
1949/50	ND	ND	3684 [b]
1950/51	ND	ND	1,091
1951/52	ND	ND	5,444
1952/53	ND	ND	2,197
1953/54	ND	ND	2,590
1954/55	ND	ND	6,131
1955/56	ND	ND	3,719
1956/57	ND	ND	4,109
1957/58	ND	ND	5,151
1958/59	ND	ND	3,335
1959/60	ND	ND	2,206
1960/61	ND	ND	1,130
1961/62	ND	ND	1,689
1962/63	ND	ND	2,030 +
1963/64	ND	ND	846
1964/65	ND	ND	921 +
1965/66	ND	ND	423
1966/67	ND	ND	525
1967/68	ND	ND	531
1968/69	ND	ND	354
1969/70	ND	ND	719
1970/71	ND	ND	1,863
1971/72	ND	ND	696
1972/73	ND	ND	586
1973/74	ND	ND	1,040
1974/75	ND	ND	1,123
1975/76	ND	ND	1,078
1976/77	ND	ND	39
1977/78	ND	ND	590
1978/79	ND	ND	106
1979/80	ND	ND	87
1980/81	1,603	363	1,966
1981/82	511	135	646
1982/83	250	119	369
1983/84	ND	ND	1,534
1984/85	1,966	14	1,980
1985/86	ND	ND	1,199
1986/87	1,114	838	1,952
1987/88	666	1,502	2,168
1988/89	138	193	331
1989/90	107	584	691
1990/91	19	12	31
1991/92	26	34	60
1992/93	52	771	823
1993/94	23	11	34
1994/95	116	318	434
1995/96	158	1,585	1,743
1996/97	104	407	511
1997/98	175	2,218	2,393
1998/99	355	7,324	7,679
1999/00	189	2,961	3,150
2000/01	250	391	641
2001/02	226	82	308
2002/03	99	3	102
2003/04	149	0	149
2004/05	234	0	234
2005/06	184	69	253
2006/07	492	1,143	1,635
2007/08	423	199	623 [a]
2008/09	305	10	315
2009/10	324	0	324
2010/11	166	0	166
2011/12	423	0	423
2012/13	934	1	935
2013/14	609	0	609
2014/15	215	0	215
2015/16	159	0	159
2016/17	59	0	59
2017/18	179	0	179
2018/19	323	0	323
2019/20	274	0	274
2020/21	212	0	212
2021/22	234	0	234

[a] Includes fish with unknown origin

[b] Estimated ladder counts; Initially, total female count was calculated on a regression of total females versus total egg takes. Total ladder count was then calculated from a regression of total females versus total (female+male) counts (SEC 1995).

Sources: PG&E 2016e–2018e, 2019k, 2020e–2022e

Spawning and rearing habitat for steelhead occurs in the unregulated tributaries above and below Cape Horn Dam, in addition to the mainstem Eel River. Juvenile steelhead abundance data were collected by VTN (1982) and SEC (1998) at eight sites on six tributary streams between 1981 and 1995 and by PG&E (2018) at four supplemental sites on four tributaries in 2017 and 2018 (Table 3.3.3-5). One of the sites, Bucknell Creek, was selected as a long-term monitoring index site, representative of the other sites. At Bucknell Creek, steelhead densities varied between 1981 and 1995 from 1,333 to 5,300 fish per kilometer (km), typically with densities higher than 2,000 fish/km (Table 3.3.3-6). At the tributary monitoring sites, relatively low summer flows limited habitat quality, resulting in slower growth rates than in the Eel River. Juveniles in tributary streams generally reared for 2 to 3 years before emigrating, whereas juveniles in the Eel River between Scott and Cape Horn dams often migrated the spring after they hatched (SEC 1998). The tributaries, however, provided important habitat that was free of pikeminnow predation and competition.

PG&E monitored steelhead during summer rearing surveys at the four supplemental sites in 2017 and 2018 on the upper mainstem Eel River at Soda Creek, Benmore Creek, Thomas Creek, and Garcia Creek. These sites were selected in collaboration with NMFS and had previously not been sampled since the 1980s-1990s (Table 3.3.3-7). In general, steelhead densities at these four sites were lower in 2017 and 2018 as compared to historical sampling in the 1980s and 1990s (Table 3.3.3-7). On average, juvenile steelhead density at these four sites was 38 percent of historical values. At the Upper Soda Creek location, historical steelhead densities varied from 867 to 11,567 with an average of 4,120 fish per km. During the 2017 and 2018 surveys of Upper Soda Creek, steelhead densities ranged from 273 to 1,433 fish per km, averaging 853 fish per km. At the Benmore Creek location, historical steelhead densities varied from 67 to 10,333 fish per km with an average of 3,840 fish per km. During the 2017 and 2018 surveys of Benmore Creek, steelhead densities ranged from 1,977 to 2,000 fish per km, averaging 1,989 fish per km. At the Thomas Creek location, historical steelhead densities varied from 767 to 9,767 with an average of 5,911 fish per km. During the 2017 and 2018 surveys of Thomas Creek, steelhead densities ranged from 2,000 to 2,833 fish per km, averaging 2,417 fish per km. At the Garcia Creek location, historical steelhead densities varied from 167 to 7,500 with an average of 2,389 fish per km. During the 2017 and 2018 surveys of Garcia Creek, steelhead densities ranged from 188 to 1,625 fish per km, averaging 907 fish per km (PG&E 2019i).

VTN (1982) conducted steelhead spawning surveys in 15 tributaries from Scott Dam to Outlet Creek. The larger tributaries (Soda, Panther, and Tomki creeks) had the best flow conditions, spawning habitat, and steelhead numbers. The number of steelhead spawning in the tributaries upstream of Cape Horn Dam appeared to be substantially lower than the number spawning in the mainstem above Cape Horn Dam. During 1980 to 1981, 1,530 adult steelhead passed over Cape Horn Dam by February 8, of which only 75 were observed in the tributaries in mid-February (VTN 1982) (note: spawning observations in the mainstem Eel River were precluded due to turbid water conditions).

Table 3.3.3-5. List of tributary summer rearing index sites.

Tributary Site	Years Sampled
Soda Creek	1981–1982 1986–1988 1990–1995 2017–2018
Upper Panther Creek (tributary to Soda Creek)	1990–1995
Lower Panther Creek (tributary to Soda Creek)	1990–1995
Benmore Creek	1981–1982 1986–1988 2017–2018
Upper Bucknell Creek	1991–1995
Lower Bucknell Creek	1981–1982 1986–1995
Thomas Creek	1981–1982 1986–1988 2017–2018
Garcia Creek	1981–1982 1986–1988 2017–2018

Sources: SEC 1996; PG&E 2019i

Table 3.3.3-6. Summary of summer rearing survey catch data from the tributary index site (Lower Bucknell Creek).

Species	Catch data	1981	1982	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Pacific Lamprey	Est. pop.	0	0	5	4	6	25	35	27	38	1	8	40
	% of tot.	0	0	3	6	7	17	17	20	33	1	6	20
	Fish/km	0	0	167	133	200	806	1,167	871	1,267	33	267	1,333
	Fish/ha	0	0	431	388	613	2,413	3,205	2,589	3,671	84	959	3,401
Steelhead/ Rainbow Trout	Est. pop.	40	80	133	67	60	110	141	84	45	87	41	159
	% of tot.	85	80	87	94	67	77	68	62	39	91	33	80
	Fish/km	1,333	2,667	4,433	2,233	2,000	3,548	4,700	2,710	1,500	2,900	1,367	5,300
	Fish/ha	6,231	5,674	11,466	6,492	6,135	10,618	12,912	8,054	4,348	7,348	4,916	13,520
	0+/1+ length break (mm)	102	92	99	99	99	89	89	79	89	89	89	89
	YOY mean length (mm)	57	63	52	57	62	55	53	61	69	58	68	64
	% YOY*	84	90	91	88	90	87	83	70	86	89	57	91
	% older*	16	10	9	12	10	13	17	30	14	11	43	9
California Roach	Est. pop.	7	20	15	0	24	8	30	25	31	8	75	0
	% of tot.	15	20	10	0	27	6	14	18	27	8	60	0
	Fish/km	233	667	533	0	797	258	1,000	806	1,033	267	2,500	0
	Fish/ha	1,090	1,418	1,379	0	2,444	772	2,747	2,397	2,995	676	8,993	0
Ptychocheilus grandis	Est. pop.	0	0	0	0	0	0	0	0	0	0	0	0
	% of tot.	0	0	0	0	0	0	0	0	0	0	0	0
	Fish/km	0	0	0	0	0	0	0	0	0	0	0	0
	Fish/ha	0	0	0	0	0	0	0	0	0	0	0	0
Sacramento Sucker	Est. pop.	0	0	0	0	0	0	2	0	0	0	0	0
	% of tot.	0	0	0	0	0	0	1	0	0	0	0	0
	Fish/km	0	0	0	0	0	0	67	0	0	0	0	0
	Fish/ha	0	0	0	0	0	0	183	0	0	0	0	0
Green Sunfish	Est. pop.	0	0	0	0	0	0	0	0	0	0	0	0
	% of tot.	0	0	0	0	0	0	0	0	0	0	0	0
	Fish/km	0	0	0	0	0	0	0	0	0	0	0	0
	Fish/ha	0	0	0	0	0	0	0	0	0	0	0	0
All Species Combined	Est. pop.	47	100	153	71	90	143	208	136	114	96	124	199
	Fish/km	1,566	3,334	5,133	2,366	2,997	4,612	6,933	4,387	3,800	3,200	4,133	6,633
	Fish/ha	7,321	7,092	13,276	6,880	9,192	13,803	19,048	13,039	11,014	8,108	14,868	16,922

* Percent YOY and percent older based on field sample data only (not estimated numbers).

** Estimated populations for all species and all years have been recalculated using Microfish program. Values may differ from those in annual progress reports.

Source: SEC 1998: Table 4.7-4

Table 3.3.3-7. Estimated historical steelhead trout lineal densities at summer rearing sites in tributaries of the Upper Eel River.

Site		1981 June 9-6	1981 Aug 25-28	1982 Aug 24-26	1986 Aug 18-21	1987 Aug 26-Sept 18	1988 Aug 24-25	1989 Aug 25	1990 Aug 29-Sept 11	1991 Aug 28-29	1992 Sept 2 - 3	1993 Aug 17 - 23	1994 Aug 30 - Sept 1	1995 Aug 30 - Sept 7	2017 Aug 3 - 9	2018 ** Sept 7 & Oct 11-12
Upper Panther Creek 18N, 10W, ec. 4 SW, elev. 2,000' 3 Passes, 30 m Station	Total Catch	*	*	*	*	*	*	*	35	60	19	39	42	63	*	*
	Lineal density, fish/km								1,167	2,000	633	1,300	1,400	2,100		
Lower Panther Creek 18N, 10W, Sec 4 SE, elev. 1,880' 3 Passes, 30 m Station	Total Catch	*	*	*	*	*	*	*	104	62	38	86	*	62	*	*
	Lineal density, fish/km								3,467	2,067	1,267	2,867		2,067		
Upper Soda Creek 18N, 10W, Sec 4 SE, elev. 1,800' 3 Passes, 30 m Station	Total Catch	347	132	75	180	26	200	*	53	113	60	117	139	41	39	9
	Lineal density, fish/km	11,567	4,400	2,500	6,000	867	6,667		1,767	3,767	2,000	3,900	4,633	1,367	1,433	273
Benmore Creek 18N, 10W, Sec 21 SE, elev. 1,740' 3 Passes, 30 m Station	Total Catch	310	*	106	120	38	2	*	*	*	*	*	*	*	63	83
	Lineal density, fish/km	10,333		3,533	4,000	1,267	67								2,000	1,977±
Upper Bucknell Creek 17N, 11W, Sec 12 SE, elev. 1,840' 3 Passes, 30 m Station	Total Catch	*	*	*	*	*	*	*	191	97	77	105	65	63	*	*
	Lineal density, fish/km								6,367	3,233	2,567	3,500	2,167	2,100		
Lower Bucknell Creek 17N, 11W, Sec 2 NE, elev. 1,640' 3 Passes, 30 m Station	Total Catch	303	38	80	116	75	58	105	135	81	44	82	35	65	*	*
	Lineal density, fish/km	10,100	1,267	2,667	3,867	2,500	1,933	3,500	4,500	2,700	1,467	2,733	1,167	2,167		
Thomas Creek 19N, 12W, Sec. 25 NE, elev. 1,520' 3 Passes, 30 m Station	Total Catch	270	61	126	291	23	293	*	*	*	*	*	*	*	85	51
	Lineal density, fish/km	9,000	2,033	4,200	9,700	767	9,767								2,833	2,000
Garcia Creek 19N, 12W, Sec 23 NW, elev. 1,360' 3 Passes, 30 m Station	Total Catch	225	70	93	5	10	27	*	*	*	*	*	*	*	50	6
	Lineal density, fish/km	7,500	2,333	3,100	167	333	900								1,625	188

* No survey conducted

** In 2018, due to the Mendocino Complex Fires, electrofishing surveys were delayed. Surveys were conducted on Sept 7 at Thomas and Garcia Creeks, Oct 11 at Benmore Creek, and Oct 12 at Upper Soda Creek.

± 2018 Benmore Creek site was 44 m long vs. 34 m in 2017. While the total catch number was higher, the lineal density was lower due to the longer reach surveyed.

A decline in juvenile steelhead and a rapid increase in Sacramento pikeminnow populations beginning in the early 1980s are seen in the historical sampling data (fish/km) at three quantitative monitoring sites in the Eel River above Cape Horn Dam (Table 3.3.3-8 and Figure 3.3.3-8) and two long-term monitoring sites below Cape Horn Dam (Table 3.3.3-9 and Table 3.3.3-10; Figure 3.3.3-9 and Figure 3.3.3-10). Data are not available prior to 1981 or from 1983 to 1985, so the ability to discern early trends is limited, particularly for juvenile steelhead. However, because pikeminnow were introduced in approximately 1979, it is easy to see the rapid increase and then quasi-equilibrium in pikeminnow numbers in the data. Qualitative sampling above Cape Horn Dam (Figure 3.3.3-9) shows a robust pikeminnow population with large annual variation.

Juvenile steelhead sampling data since 2005 at seven quantitative sampling sites below Cape Horn Dam (Table 3.3.3-11) and three qualitative sampling sites above Cape Horn Dam (Table 3.3.3-8) show that summer rearing occurs in the Eel River from Scott Dam to several miles downstream of Van Arsdale Reservoir, with numbers generally decreasing with increasing distance downstream of the reservoir. The Thomas Creek site, located 8 mi. below Van Arsdale Reservoir, is the farthest downstream monitoring site on the Eel River with a consistent steelhead presence each year. Pikeminnow numbers (Table 3.3.3-11) are high at all sites downstream of Cape Horn Dam. Since 2021, only two sampling sites (Eel River below Cape Horn Dam and Eel River below Emandal) have consistently been surveyed each year. Only a few steelhead have been observed at the Emandal site, and Sacramento pikeminnow populations are thriving.

The decreasing density of juvenile steelhead with distance downstream of Cape Horn Dam is consistent with the pattern of increasing water temperature (see Section 3.3.2 for additional information). Kubicek (1977) classified the Eel River between Cape Horn Dam and Tomki Creek as thermally marginal and the lower river as thermally lethal. At the farthest downstream sites, despite the very high temperatures, low numbers of juvenile steelhead are present in some years. Small, localized areas with suitable temperatures can persist in the Eel River at the downstream sites due to cool-water thermal refugia created by bank seeps, hyporheic flow upwelling, cold water inflows, and stratified pools in the vicinity of cool water inflows (Beak Consultants 1986; Kubicek 1977).

Migration. Downstream migration of juvenile steelhead past Cape Horn Dam varies widely within and between years, ranging from January to June (SEC 1998). Monitoring data over 12 years indicate that older juveniles (age 1^+ and 2^+) emigrate earlier (median departures in March and April) than young-of-year fish (age 0^+) (median departures in May and June) (Table 3.3.3-12).

Adult steelhead upstream migration past Cape Horn Dam from 2016 to 2022 is shown in Figure 3.3.3-11 and Figure 3.3.3-12 in relation to date and recorded streamflow. Records indicate that most steelhead in the Upper Eel River Watershed move upstream to spawn between December and May, peaking in January and March (winter run), with lower numbers of steelhead moving upstream between April and June (summer run).

Table 3.3.3-8. Summary table of summer rearing survey fish catch data from the three mainstem Eel River index sites above Cape Horn Dam combined (Eel River below Trout Creek, Eel River above Bucknell Creek, and Eel River above Soda Creek).

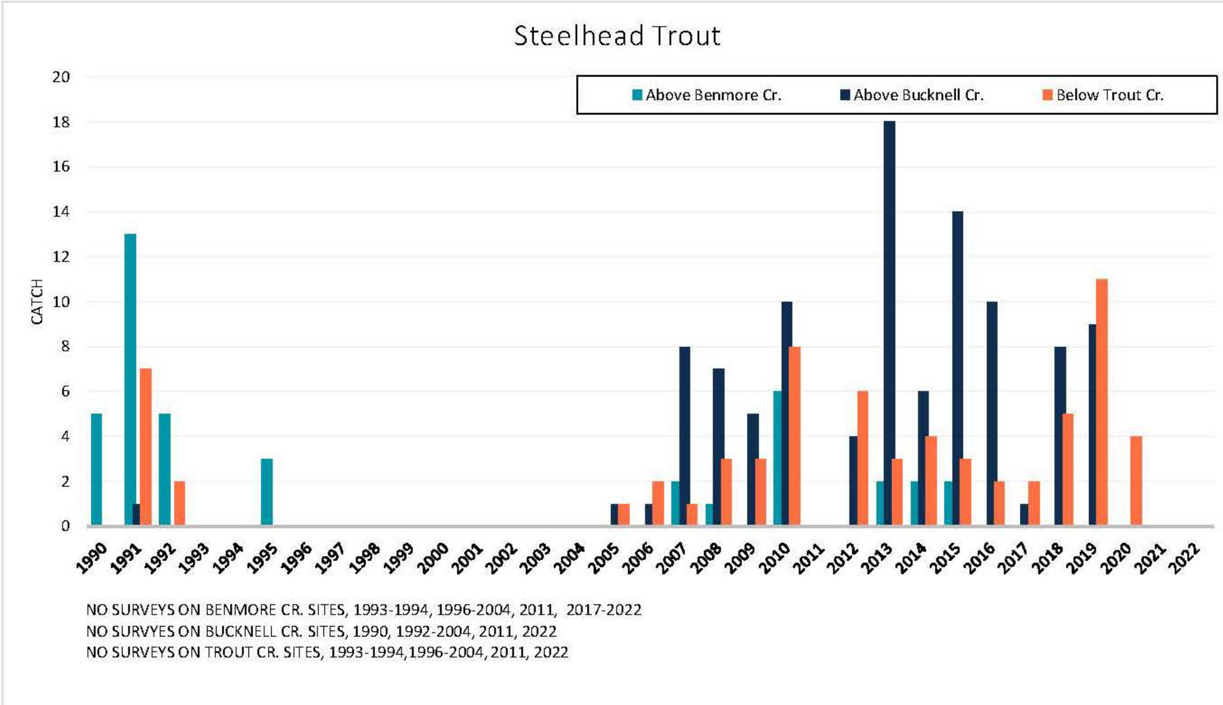
Species	Catch data	1981	1982	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Pacific Lamprey	Est. pop.	≥9	12	79	28	12	464	79	117	130	38	31	46
	% of tot.	N/A	0	5	1	0	21	4	6	11	5	3	2
	Fish/km	≥100	133	293	117	45	1,719	293	433	481	141	115	170
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Steelhead/ Rainbow Trout	Est. pop.	1,745*f*	602	441	617	1,495	296	230	174	148	313	100	137
	% of tot.	N/A	22	26	21	59	14	12	9	13	42	9	6
	Fish/km	19,393*f*	6,689	1,633	2,571	5,620	1,096	852	644	548	1,159	370	507
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	0+/1+ length break (mm)	112	132	169	169	189	189	179	179	179	179	189	189
	YOY mean length (mm)	65	95	97	96	87	101	105	110	124	101	125	106
	% YOY*	99	89	93	98	99	96	98	96	87	100	81	97
	% older*	1	11	7	3	1	4	2	4	13	0	19	3
California Roach	Est. pop.	≥118	743	600	1,919	543	1,083	590	780	558	147	460	298
	% of tot.	N/A	27	35	67	21	50	31	39	48	19	41	14
	Fish/km	≥1311	8,256	2,222	7,996	2,041	4,011	2,185	2,889	2,067	544	1,704	1,104
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ptychocheilus grandis	Est. pop.	0	1	482	184	296	237	815	432	214	137	401	1,406
	% of tot.	N/A	<1	28	6	12	11	43	21	18	18	36	65
	Fish/km	0	11	1,785	767	1,113	878	3,019	1,600	793	507	1,485	5,207
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sacramento Sucker	Est. pop.	≥8	1,426	112	136	194	85	200	507	119	119	113	291
	% of tot.	N/A	51	7	5	8	4	10	25	10	16	10	13
	Fish/km	≥89	15,844	415	568	729	315	741	1,878	441	441	419	1,078
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Green Sunfish	Est. pop.	≥5	0	0	0	0	1	0	2	4	0	6	0
	% of tot.	N/A	0	0	0	0	0	0	0	0	0	1	0
	Fish/km	≥56	0	0	0	0	4	0	7	15	0	22	0
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Species Combined	Est. pop.	≥1,902	2,182	1,714	2,884	2,540	2,166	1,914	2,012	1,173	754	1,111	2,178
	Fish/km	≥21,133	30,933	6,348	12,018	9,549	8,022	7,089	7,452	4,344	2,793	4,115	8,067
	Fish/ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* Percent YOY and percent older based on field sample data only (not estimated number).

** Estimated populations for all species and all years, except 1981, have been recalculated using Microfish program. Values may differ from those in annual progress reports.

f Estimated populations and fish densities based on a regression of actual first pass catch vs. estimated populations for 1982 through 1995 (r^2=0.88). See SEC (1996) for details.

Source: SEC 1998: Table 4.7-3



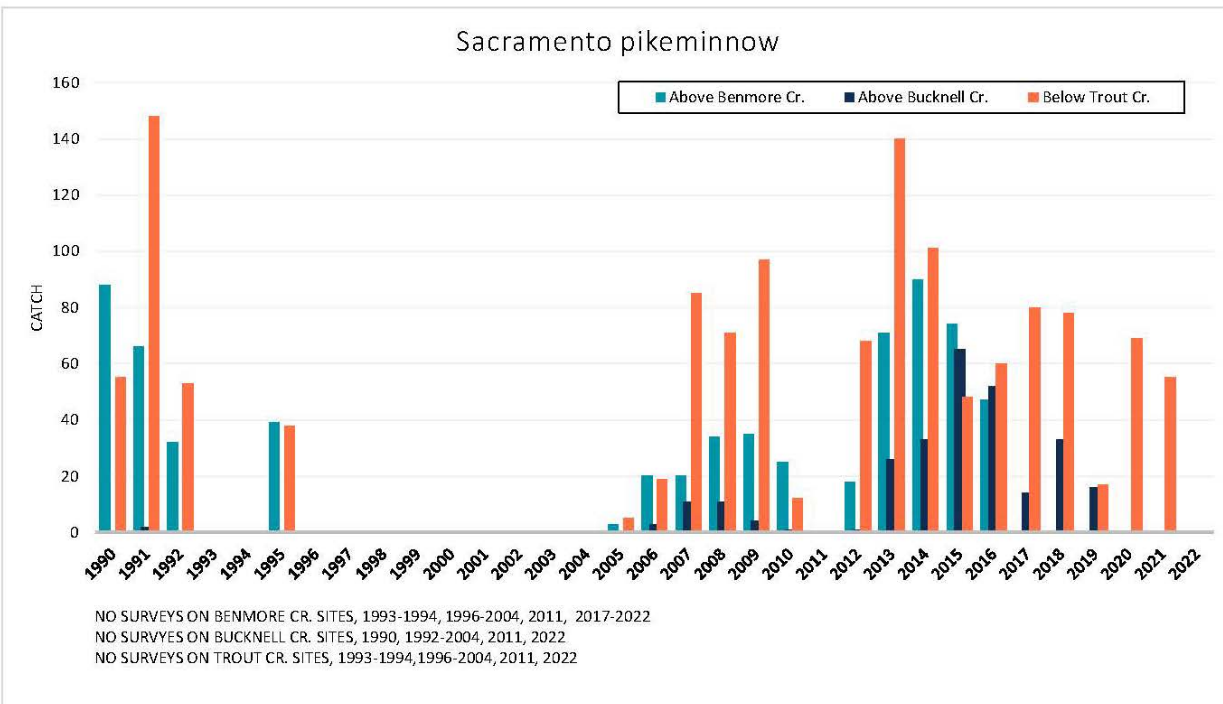


Figure 3.3.3-8. Historical raft electrofishing catch data, steelhead (top) and Sacramento pikeminnow (bottom), for surveys conducted during August in the Eel River above Cape Horn Dam.

Table 3.3.3-9. Estimated historical lineal densities for all species captured during summer rearing surveys from the site Eel below Cape Horn Dam (units: fish per kilometer).

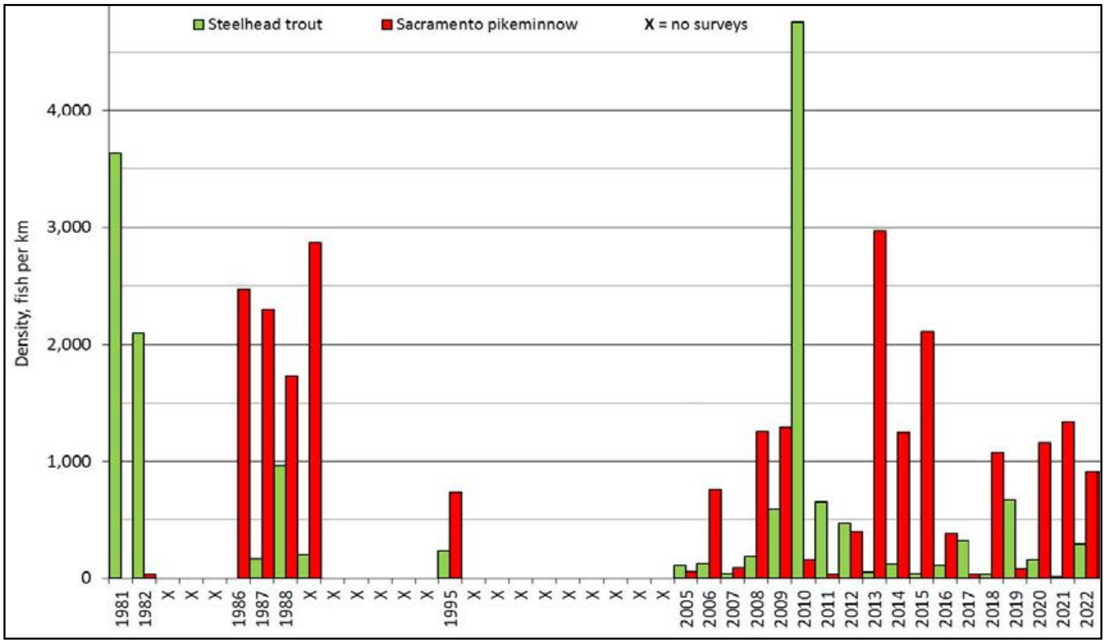
Year	Steelhead	Sacramento Pikeminnow	California Roach	Sacramento Sucker	Pacific Lamprey Ammocoete	Lepomis ssp.	Unidentified Cyprinid
1981	3,633	0	35,033	233	267	0	0
1982	2,100	33	14,933	513	267	0	0
1983–1985	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1986	0	2,467	5,300	400	200	0	0
1987	167	2,300	12,600	233	0	0	0
1988	967	1,733	3,833	0	0	0	0
1989	200	2,867	11,800	0	0	0	0
1990–1994	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1995	233	733	1,867	233	67	0	0
1996–2004	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2005	110	60	380	10	20	0	0
2006	125	760	94	21	0	0	0
2007	40	90	60	10	0	0	0
2008	186	1,255	1,549	0	392	0	2,843
2009	588	1,294	1,951	20	20	0	0
2010	4,755	157	618	0	29	0	10
2011	650	30	750	100	20	10	0
2012	468	397	539	0	10	0	0
2013	50	2,970	1,030	10	30	0	270
2014	120	1,250	2,670	10	60	0	160
2015	40	2,110	2,580	0	30	10	270
2016	110	380	1,510	10	40	0	110
2017	320	30	340	110	150	10	870
2018	30	1,080	2,840	60	0	10	50
2019	670	80	20	120	10	30	30
2020	160	1,160	2,170	10	10	0	20
2021	10	1,340	2,040	10	80	0	240
2022	290	910	650	10	30	0	10

Source: PG&E 2023c

Table 3.3.3-10. Estimated historical lineal densities for all species captured during summer rearing surveys from the site Eel below Emandal (units: fish per kilometer).

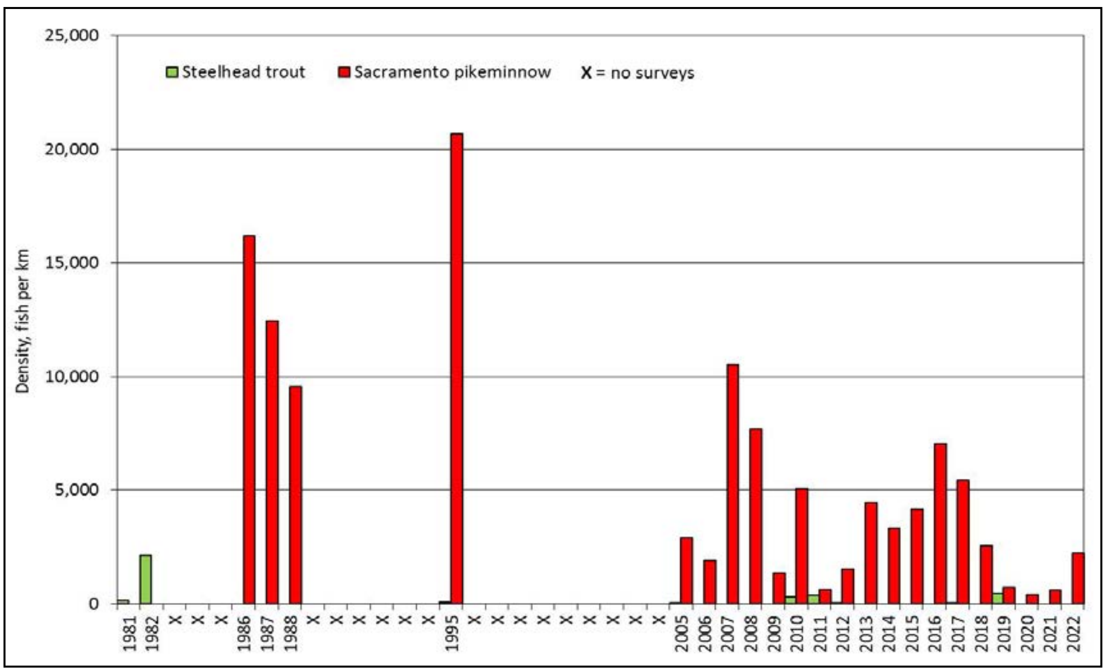
Year	Steelhead	Sacramento Pikeminnow	California Roach	Sacramento Sucker	Pacific Lamprey Ammocoete	Lepomis ssp.	Unidentified Cyprinid
1981	133	0	27,167	100	33	0	0
1982	2,133	0	13,367	200	0	0	0
1983–1985	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1986	0	16,167	3,567	5,133	67	67	0
1987	0	12,467	2,067	0	0	0	0
1988	0	9,567	9,167	67	0	0	0
1989	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1990–1994	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1995	67	20,700	233	800	33	0	0
1996–2004	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2005	33	2,911	589	44	0	0	0
2006	0	1,904	0	23	459	0	0
2007	0	10,522	3,278	0	11	0	0
2008	0	7,690	720	0	350	10	860
2009	0	1,340	2,830	0	50	0	0
2010	310	5,050	570	850	800	10	1,400
2011	370	600	950	10	60	0	1,500
2012	40	1,510	80	0	0	0	10
2013	0	4,450	360	150	1,050	0	10
2014	0	3,330	960	50	160	30	10
2015	0	4,170	5,370	40	150	1,150	30
2016	0	7,040	4,130	710	1,450	100	40
2017	30	5,450	100	230	80	0	1,810
2018	0	2,535	4,545	20	0	40	0
2019	440	700	410	2,500	20	0	50
2020	0	380	1,390	0	240	0	30
2021	0	570	2,550	20	210	220	80
2022	0	2,210	1,860	90	300	590	90

Source: PG&E 2023c



Source: PG&E 2023c: Figure 3.1-3

Figure 3.3.3-9. Estimated lineal densities for steelhead and Sacramento pikeminnow captured during summer rearing surveys from the site Eel below Cape Horn Dam.



Source: PG&E 2023c: Figure 3.1.4

Figure 3.3.3-10. Estimated lineal densities for steelhead and Sacramento pikeminnow captured during summer rearing surveys from the site Eel below Emandal.

Table 3.3.3-11. Estimated lineal densities of juvenile steelhead (top) and Sacramento pikeminnow (bottom) at summer rearing monitoring sites between Cape Horn Dam and Dos Rios, 2005–2022.

STEELHEAD	Eel below Cape Horn Dam (Historical index site)		Eel above Tomki Creek		Eel below Thomas Creek		Eel below Emandal		Eel below Hearst		Eel above Fish Creek		Eel between Outlet Creek and Middle Fork	
	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)
2005	110	(149)	33	(158)	1,033	(87)	33	(49)	0	No Data	0	No Data	0	No Data
2006	125	(114)	267	(107)	252	(69)	0	No Data	0	No Data	0	No Data	0	No Data
2007	40	(160)	120	(79)	600	(79)	0	No Data	0	No Data	0	No Data	30	(171)
2008	186	(113)	100	(82)	60	(77)	0	No Data	0	No Data	0	No Data	300	(103)
2009	588	(112)	60	(75)	250	(78)	0	No Data	0	No Data	0	No Data	33	(101)
2010	4755	(100)	1,300	(79)	4,100	(73)	310	(80)	0	No Data	0	No Data	22	(99)
2011	650	(97)	1,611	(80)	2,133	(64)	370	(74)	748	(121)	0	No Data	63	(105)
2012	468	(104)	270	(94)	1.767	(66)	40	(75)	0	No Data	0	No Data	223	(138)
2013	50	(99)	22	(69)	233	(67)	0	No Data	0	No Data	0	No Data	0	No Data
2014	120	(124)	44	(69)	33	(78)	0	No Data	0	No Data	0	No Data	83	(83)
2015	40	(130)	22	(70)	33	(49)	0	No Data	0	No Data	0	No Data	0	No Data
2016	110	(169)	33	(115)	533	(60)	0	No Data	0	No Data	0	No Data	0	No Data
2017	320	(122)	165	(92)	2,495	(67)	30	(58)	No Data	No Data	No Data	No Data	0	No Data
2018	30	(113)	0	No Data	61	(97)	0	No Data	No Data	No Data	No Data	No Data	0	No Data
2019	670	(98)	692	(94)	No Data	No Data	440	(80)	No Data	No Data	No Data	No Data	No Data	No Data
2020	160	No Data	33	No Data	No Data	No Data	0	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2021	10	No Data	No Data	No Data	No Data	No Data	0	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2022	290	No Data	No Data	No Data	No Data	No Data	0	No Data	No Data	No Data	No Data	No Data	No Data	No Data

PIKEMINNOW	Eel below Cape Horn Dam (Historical index site)		Eel above Tomki Creek		Eel below Thomas Creek		Eel below Emandal		Eel below Hearst		Eel above Fish Creek		Eel between Outlet Creek and Middle Fork	
	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)	Lineal density, fish/km	(Mean fork length, mm)
2005	60	(93)	589	(49)	11,167	(42)	2,911	(44)	945	(47)	267	(50)	2133	(51)
2006	760	(36)	9,533	(46)	978	(35)	1904	(49)	533	(70)	135	(55)	256	(64)
2007	90	(53)	4,615	(54)	3,600	(44)	10522	(59)	4031	(50)	250	(64)	1890.00	(68)
2008	1,255	(63)	16,080	(53)	940	(45)	7690	(50)	6444	(49)	820	(53)	9300.00	(49)
2009	1,294	(74)	600	(58)	12,750	(60)	1340	(49)	2913	(51)	290	(54)	445.00	(122)
2010	157	(119)	233	(56)	467	(34)	5,050	(33)	4150	(41)	310	(50)	222.00	(118)
2011	30	(85)	356	(50)	500	(44)	600	(43)	14,780	(43)	1240	(54)	1284.00	(59)
2012	397	(81)	1,040	(53)	4,967	(34)	1,510	(39)	8457	(39)	245	(66)	6223.00	(49)
2013	2,970	(58)	11,659	(50)	3,200	(51)	4450	(49)	3614	(49)	1310	(57)	4083.00	(56)
2014	1,250	(72)	1,868	(57)	1,000	(46)	3330	(46)	1748	(46)	1170	(51)	802.00	(61)
2015	2,110	(45)	6,747	(61)	1,733	(51)	4170	(51)	4047	(51)	1540	(54)	5146	(62)
2016	380	(51)	10,670	(50)	5,900	(49)	7040	(51)	6913	(58)	1620	(56)	11208	(53)
2017	30	(105)	8,484	(48)	982	(84)	5,450	(48)	No Data	No Data	No Data	No Data	7844	(54)
2018	1,080	(53)	6352	(54)	13,006	(43)	2535	(67)	No Data	No Data	No Data	No Data	3170	(65)
2019	80	(92)	6,341	(47)	No Data	No Data	700	(60)	No Data	No Data	No Data	No Data	No Data	No Data
2020	1,160	No Data	2,596	No Data	No Data	No Data	380	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2021	1,340	No Data	No Data	No Data	No Data	No Data	570	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2022	910	No Data	No Data	No Data	No Data	No Data	2210	No Data	No Data	No Data	No Data	No Data	No Data	No Data

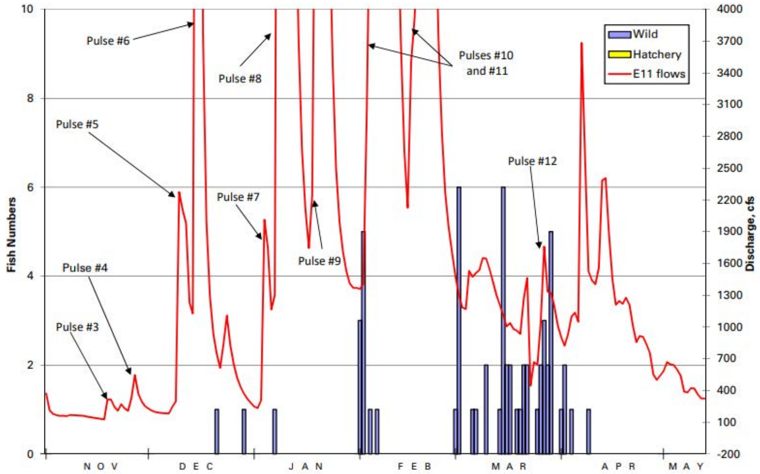
Sources: PG&E 2019i, 2020c–2022c

Table 3.3.3-12. Median departure dates for juvenile steelhead from area above Cape Horn Dam.

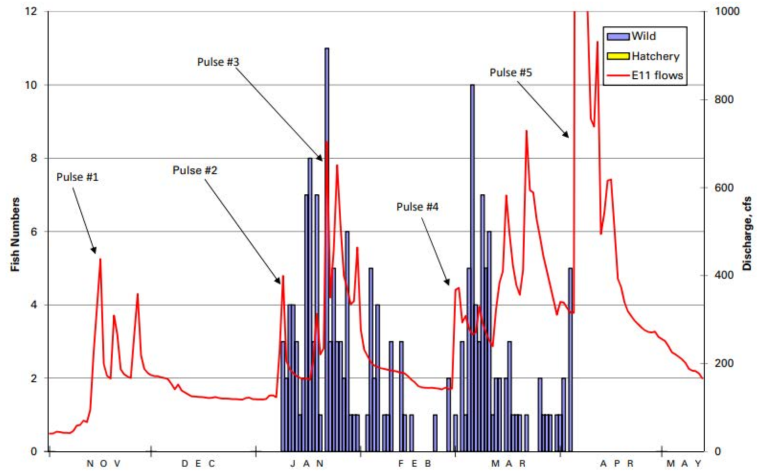
Year	0+	1+	2+/older
Mainstem Eel River above Cape Horn Dam			
1980/1981	Jun 6	Feb 21	Apr 19
1981/1982	No Data	No Data	No Data
1982/1983	No Data	No Data	No Data
1983/1984	No Data	No Data	No Data
1984/1985	May 16	Mar 3	May 12
1985/1986	May 17	Mar 30	Mar 26
1986/1987	May 5	Mar 30	Mar 24
1987/1988	May 8	[1]	[1]
1988/1989	May 31	Apr 12	Apr 16
1989/1990	May 15	Mar 8	[2]
1990/1991	Jun 26	Mar 7	Mar 6
1991/1992	May 22	Feb 24	[2]
1992/1993	May 25	Mar 23	Mar 12
1993/1994	Apr 29 [3]	Apr 3	May 2
1994/1995	Jun 16	Mar 29	May 19
Average	May 23	Mar 17	Apr 11 [4]
Bucknell Creek			
1992/93	May 14	Mar 31	[2]
1993/94	May 12	Mar 6	Mar 9
1994/95	Apr 18	Mar 23	Mar 8
Average	May 4	Mar 20	Mar 8

Source: SEC 1998: Table 4.6-1

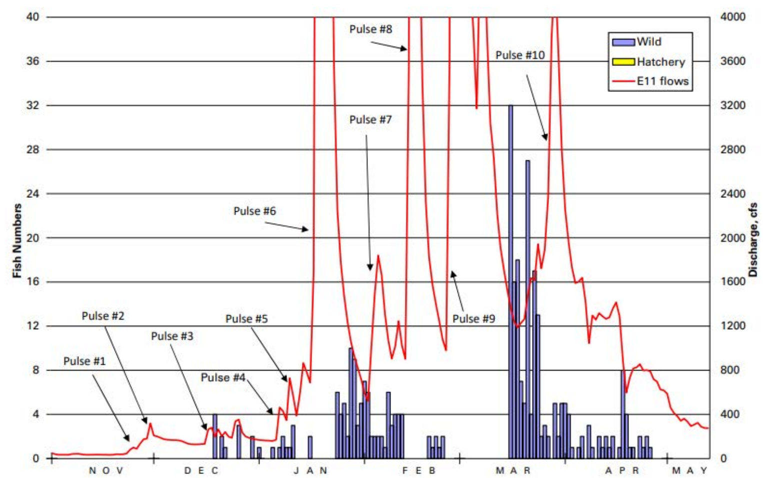
[1] Hatchery smolt component of catch precluded analysis of 1+ and older age classes.
[2] Too few fish to calculate median departure date.
[3] Fall pulse not included in 0+ calculation.
[4] This date is probably later than actual timing due to lack of early-season trapping data.



Source: PG&E 2018e

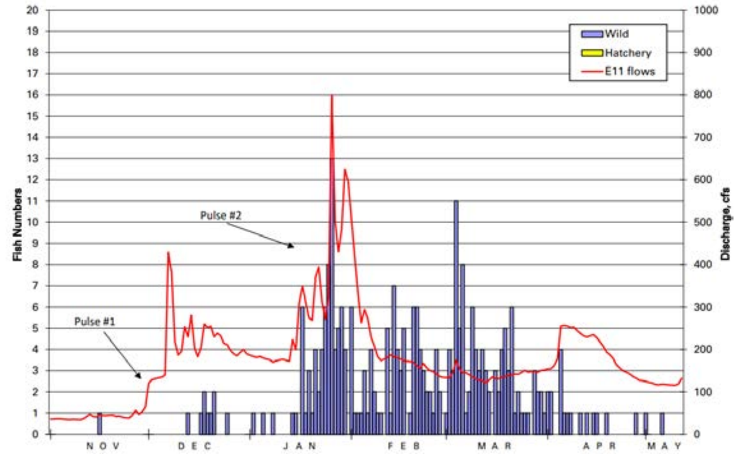


Source: PG&E 2019k

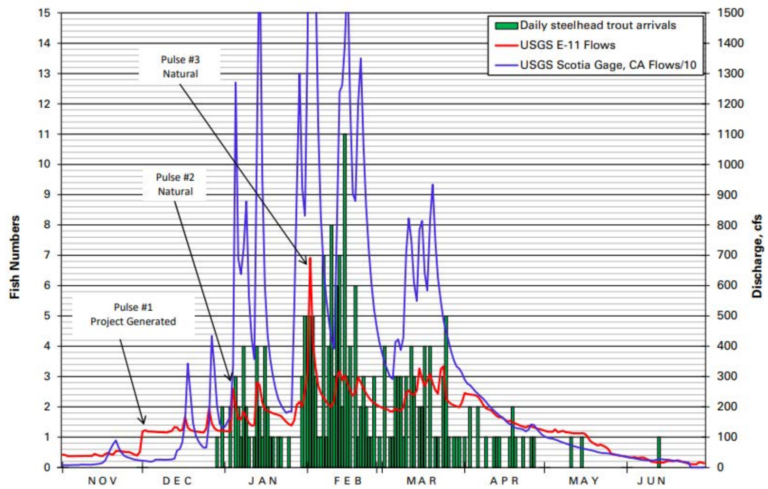


Source: PG&E 2020e

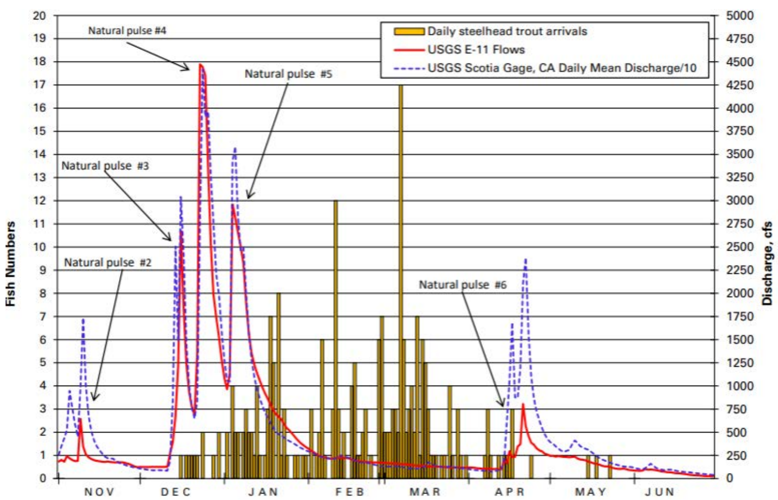
Figure 3.3.3-11. Daily arrivals of adult steelhead at the Cape Horn Dam Fish Ladder, 2016/2017 (top), 2017/2018 (middle), and 2018/2019 (bottom).



Source: PG&E 2021e



Source: PG&E 2022e



Source: PG&E 2023a

Figure 3.3.3-12. Daily arrivals of adult steelhead at the Cape Horn Dam Fish Ladder, 2019/2020 (top), 2020/2021 (middle), and 2021/2022 (bottom).

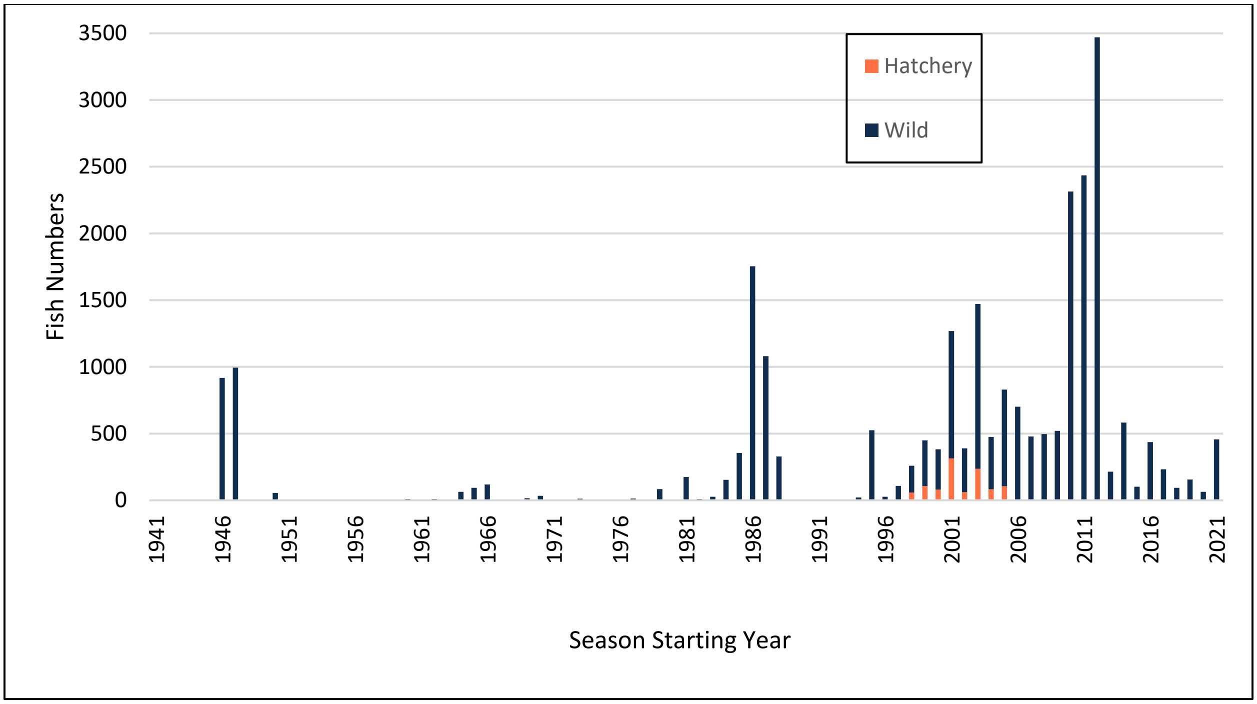
Chinook Salmon

Chinook salmon in the Eel River consist entirely of two independent populations (Spence et al. 2008). The lower Eel River population includes fish that spawn in the South Fork Eel River as well as all mainstem and tributaries downstream of the South Fork confluence (e.g., Van Duzen River and Larabee Creek). The upper Eel River population includes all fish spawning upstream of the South Fork Eel River confluence (excluded), including major tributaries such as the Middle Fork and North Fork Eel River. Spring-run populations in the Eel River watershed are considered extirpated.

Key information and observations related to Chinook salmon in the study area include the following:

- Adult Chinook salmon numbers have increased at VAFS since the mid-1980s, and numbers have decreased in Tomki Creek beginning in 1989.
- Spawning and rearing habitat exists in the mainstem Eel River below Scott Dam and below Cape Horn Dam and in two large tributaries (Outlet Creek and Tomki Creek) downstream of Cape Horn Dam.
- There is spawning and observed presence in lower Eel River tributaries (Wilson Creek, Cuddeback Creek, Fiedler Creek, Cummings Creek, Price Creek, and Atwell Creek).
- Delayed spring migration of juveniles from the Eel River above Cape Horn Dam occurs due to cold water temperature releases below Lake Pillsbury, which can affect survival as juveniles migrate through the lower Eel River and encounter stressful thermal conditions.

Annual Chinook salmon counts recorded at VAFS from 1946 to the early 1980s were typically less than 100 fish, with many years having a count of zero (Figure 3.3.3-13 and Table 3.3.3-13). An exception to this was two successive years in the late 1940s that had over 900 fish. In the mid- to late-1980s, a spike in numbers occurred, ranging up to over 1,700 fish; however, counts dropped back to single-digit levels during the early 1990s. Counts increased dramatically again beginning in the mid-1990s, when levels were sustained at typically over 300 fish. Numbers in the late 1990s through the early 2000s were influenced by a hatchery component. From 2005 to 2018 Chinook salmon counts have ranged from 215 to 3,471 fish, including three successive years with over 2,000 fish, with only three hatchery fish in the counts. However, from 2018 to 2020, Chinook salmon counts dropped significantly, ranging from 64 to 156 fish. In 2021, Chinook salmon counts increased to 457 fish (PG&E 2022e).



Sources: PG&E 2016e–2018e, 2019k, 2020e–2022e

Figure 3.3.3-13. Chinook salmon counts at VAFS, 1946–2021.

Table 3.3.3-13. Number of upstream migrating adult Chinook salmon trapped annually at VAFS based on records provided by CDFW.

Season	Wild	Hatchery	Total Count
1922 to 1940			ND
1941/42			ND
1942/43			ND
1943/44			ND
1944/45			ND
1945/46			ND
1946/47			917
1947/48			994
1948/49			ND
1949/50			ND
1950/51			55
1951/52			ND
1952/53			ND
1953/54			ND
1954/55			ND
1955/56			5
1956/57			0
1957/58			2
1958/59			0
1959/60			0
1960/61			9
1961/62			0
1962/63			9
1963/64			3
1964/65			63
1965/66			93
1966/67			119
1967/68			0
1968/69			0
1969/70			15
1970/71			34
1971/72			0
1972/73			0
1973/74			12
1974/75			1
1975/76			2
1976/77			0
1977/78			13
1978/79			5
1979/80			84
1980/81			0
1981/82			175
1982/83			9
1983/84			26
1984/85			153
1985/86			355
1986/87			1,754
1987/88			1,080
1988/89			328
1989/90			6
1990/91			0
1991/92			5
1992/93			4
1993/94			1
1994/95			21
1995/96	525	0	525
1996/97	26	0	26
1997/98	106	1	107
1998/99	141	59	200
1999/00	232	107	343 [a]
2000/01	223	80	303
2001/02	641	314	955
2002/03	268	61	329
2003/04	997	236	1,235 [a]
2004/05	309	83	392
2005/06	620	105	725
2006/07	697	2	699
2007/08	478	0	478
2008/09	496	0	496
2009/10	518	1	519
2010/11	2,314	0	2,314
2011/12	2,436	0	2,436
2012/13	3,471	0	3,471
2013/14	215	0	215
2014/15	583	0	583
2015/16	102	0	102
2016/17	436	0	436
2017/18	232	0	232
2018/19	94	0	94
2019/20	156	0	156
2020/21	64	0	64
2021/22	457	0	457

Sources: PG&E 2017e–2018e, 2019k, 2020e–2022e

[a] Includes fish with unknown origin

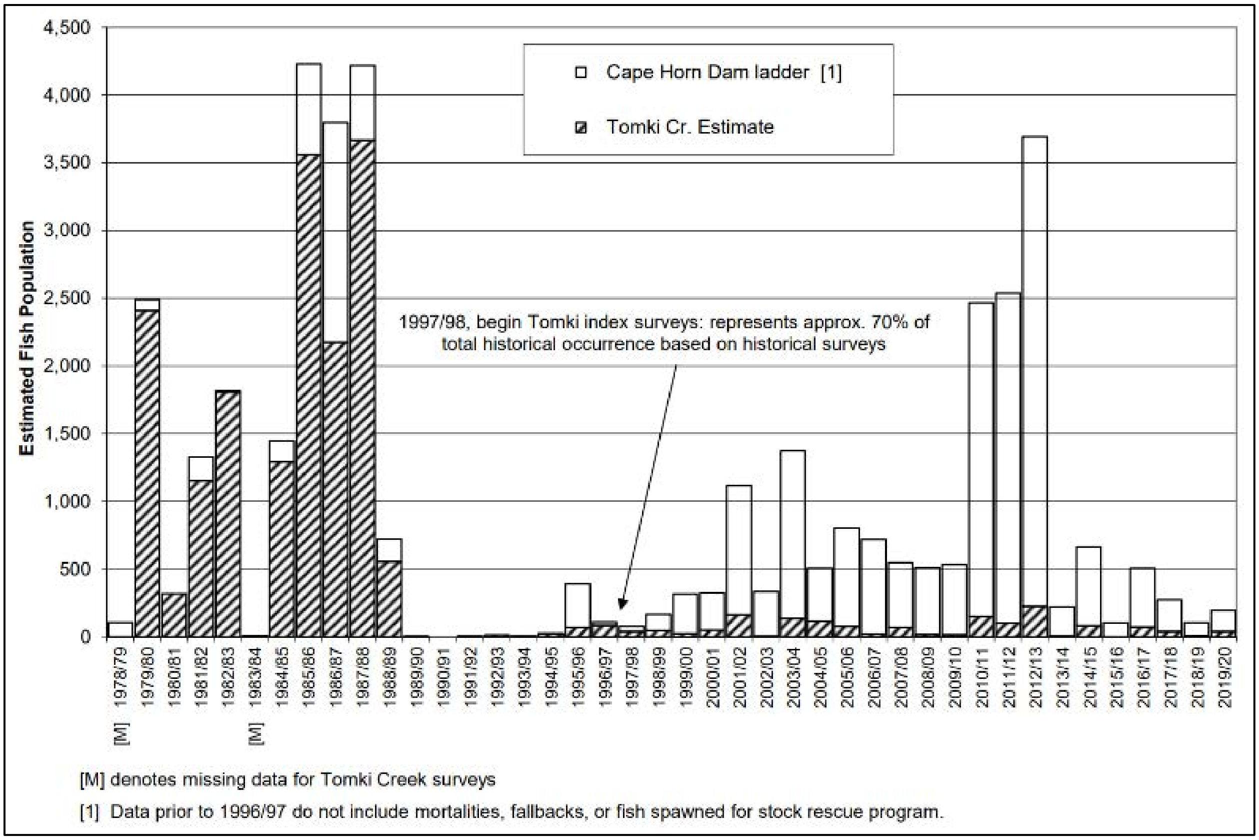
Factors at VAFS influencing adult Chinook salmon counts include: (1) changes in minimum flows below Cape Horn Dam; (2) modifications to the fish ladder; and (3) access of Chinook salmon to Tomki Creek. Prior to 1979, under the 1922 FERC license, streamflows in the Eel River below Cape Horn Dam could remain as low as 2 cfs when Lake Pillsbury was not spilling, and tributary flow was minimal. This discharge pattern probably influenced adult Chinook salmon migration. In years with little rainfall during fall and early winter, migration of adult salmon into the upper Eel River could also have been restricted. Beginning in 1979, flow releases below Cape Horn Dam were modified (increased) to mimic the pattern and timing of the natural hydrograph.

Structural improvements to the Cape Horn Dam Fish Ladder in 1962 and in 1987 also likely affected fish counts. Modifications were made in 1987 to alleviate confusing patterns of attraction flow below the fish ladder entrance. These improvements greatly reduced the average time required for Chinook salmon to find the ladder, from 12.8 hours to 0.6 hour (SEC 1998).

Increased flow releases below Cape Horn Dam during the Chinook salmon fall migration period, including those in PG&E's current FERC license as prescribed by the NMFS's RPA, which were established in 2002, have potentially affected VAFS counts positively and the Tomki Creek counts negatively. Tomki Creek is a major spawning tributary to the Eel River located approximately 4 mi. downstream of Cape Horn Dam (RM 153). Through the 1980s, Tomki Creek was the most important spawning area for Chinook salmon in the upper mainstem Eel River watershed (SEC 1998) (Figure 3.3.3-14). In 1989, the Chinook salmon population in the upper Eel River (VAFS and Tomki Creek) collapsed because of poor ocean conditions in the antecedent years that affected northern California and southern Oregon stocks (SEC 1998). The collapse (multi-generation failures) lasted for 6 years until 1995, when a rebound began. Since that time, Tomki Creek counts have not increased as much as VAFS counts have increased. Under the current flow schedule, which has higher fall flows, migrating salmon may be attracted to the Eel River above Cape Horn Dam before unregulated flows in Tomki Creek are high enough to permit upstream passage.[3]

Recorded upstream migration numbers of adult Chinook salmon past Cape Horn Dam from 2016 to 2022 are shown in Figure 3.3.3-15 and Figure 3.3.3-16 in relation to date and recorded streamflow. Recent records indicate that most Chinook in the Upper Eel River Watershed move upstream to spawn between October and January, with a peak typically in November.

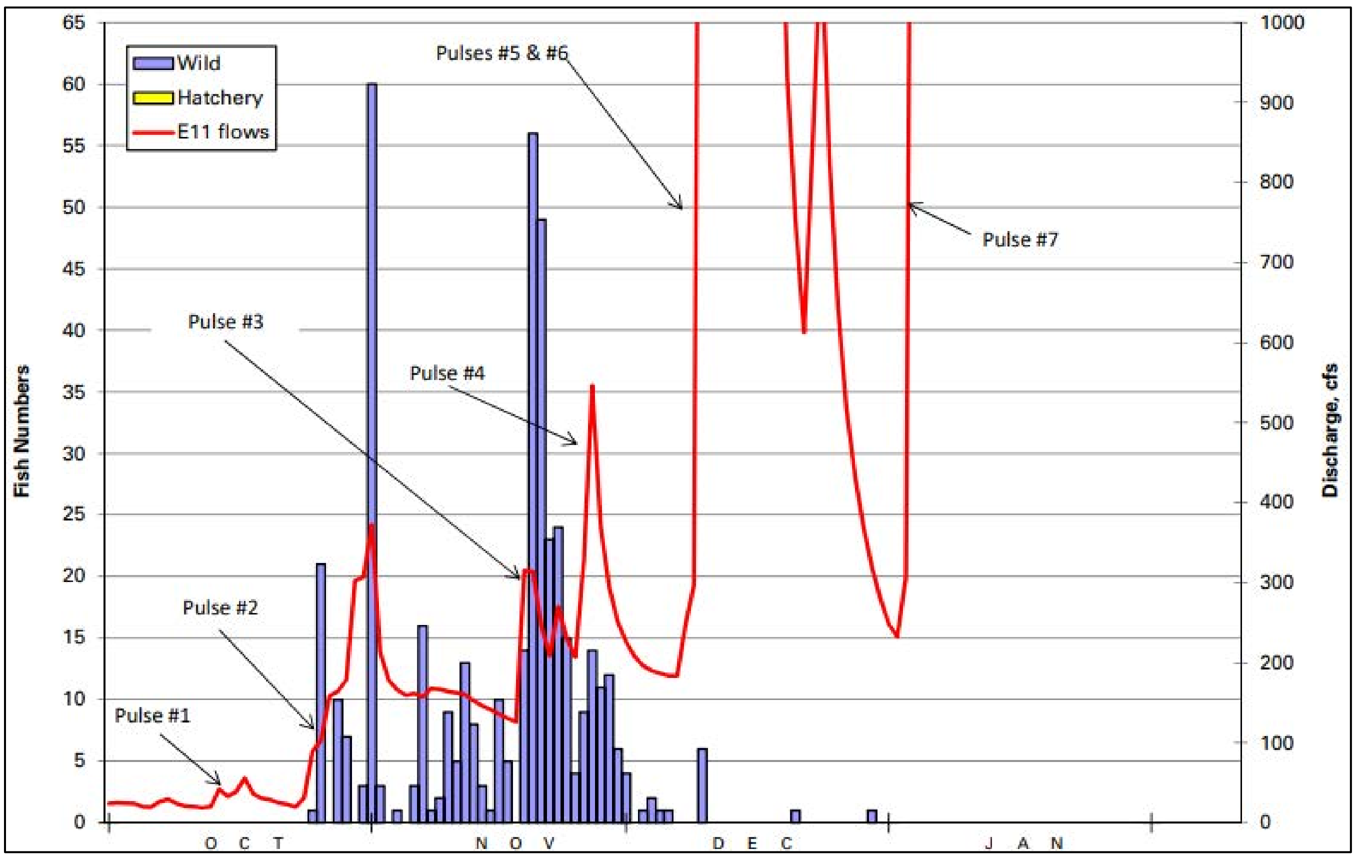
[3] Approximately 15 cfs is the minimum flow in Tomki Creek where Chinook salmon passage has been observed.



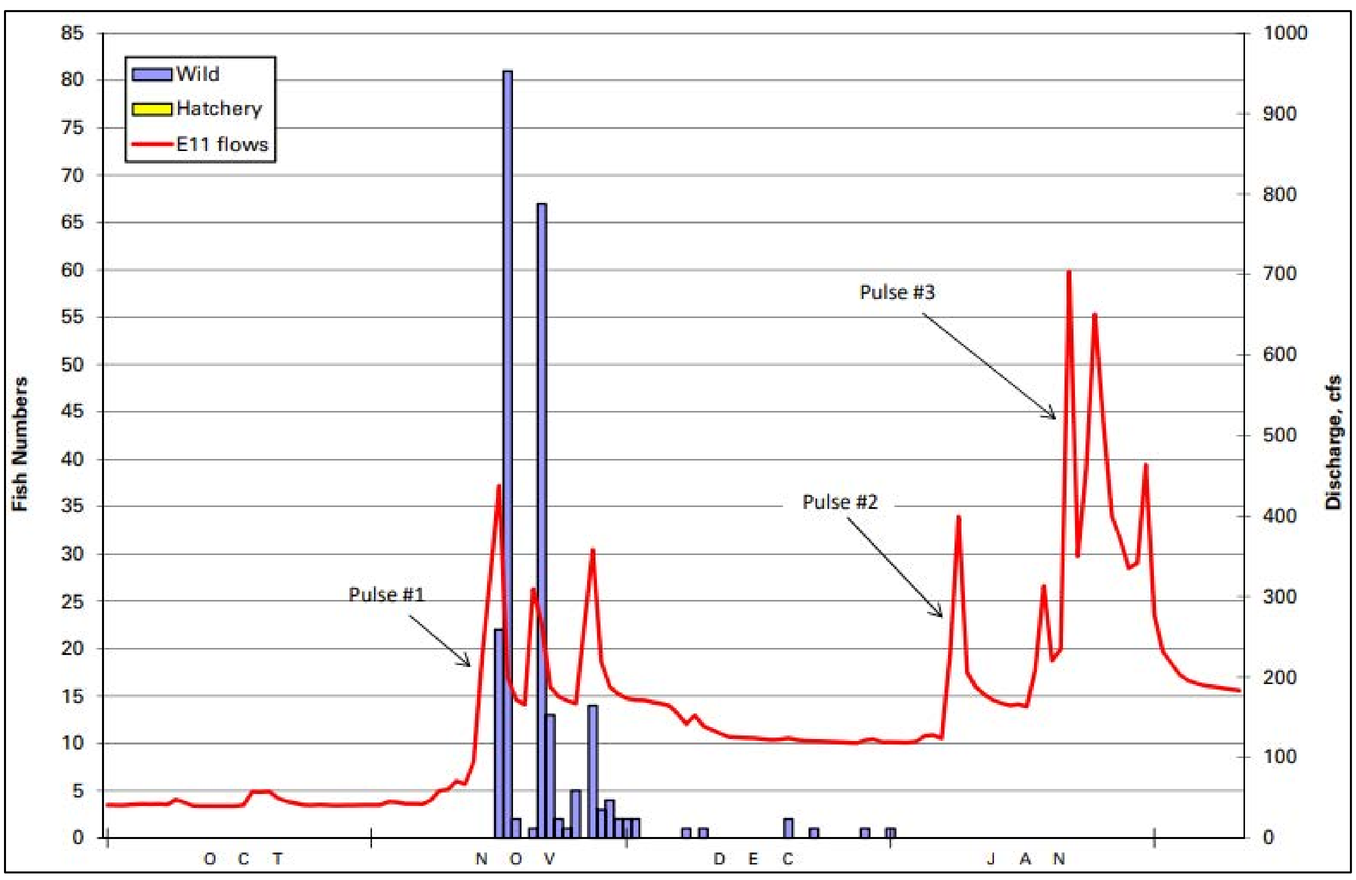
Source: PG&E 2021d: Figure 5

Figure 3.3.3-14. Historical adult Chinook salmon returns to the upper mainstem Eel River based on Cape Horn Dam (VAFS) and Tomki Creek counts.

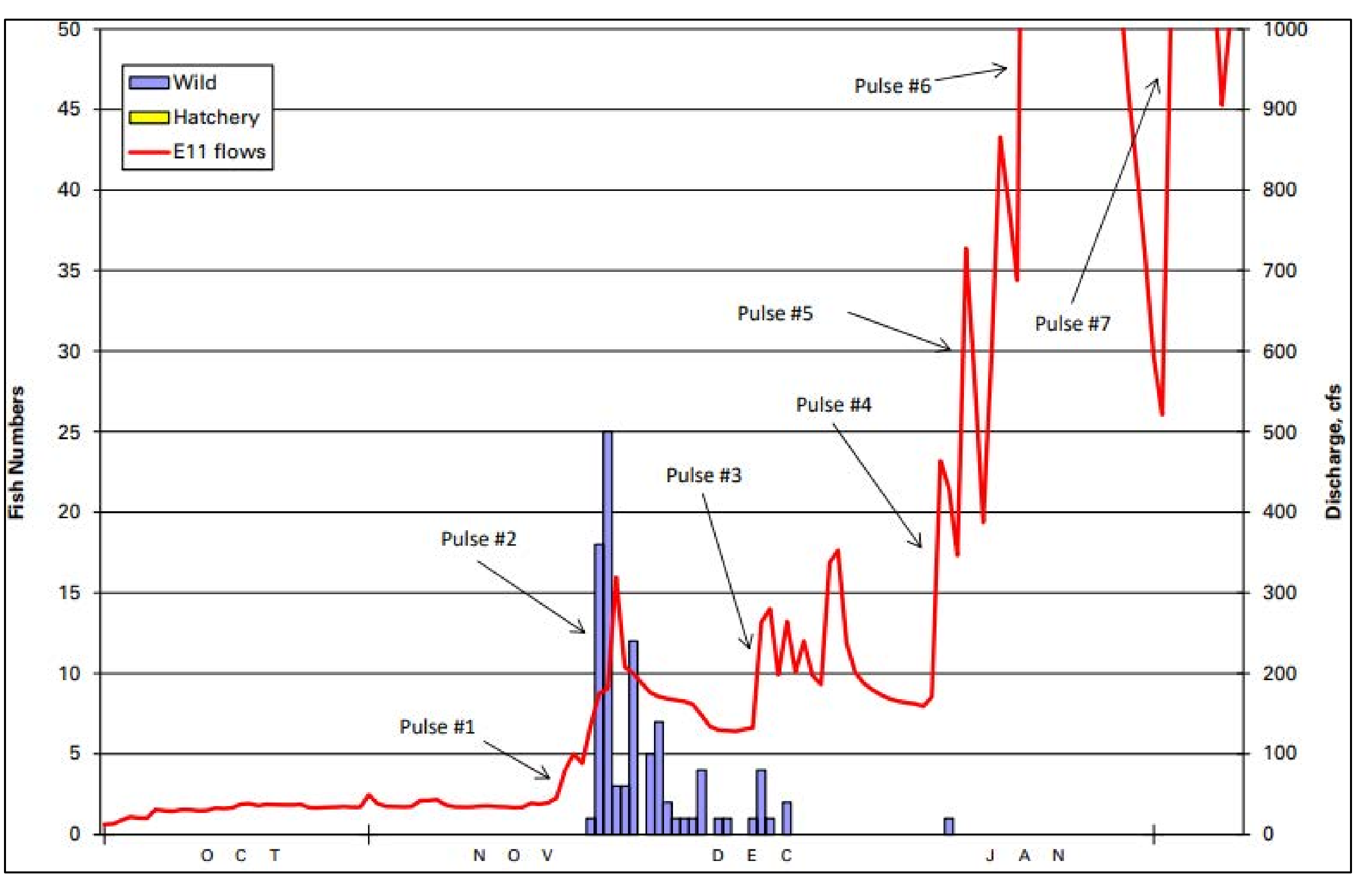
This Page Intentionally Left Blank



Source: PG&E 2018e



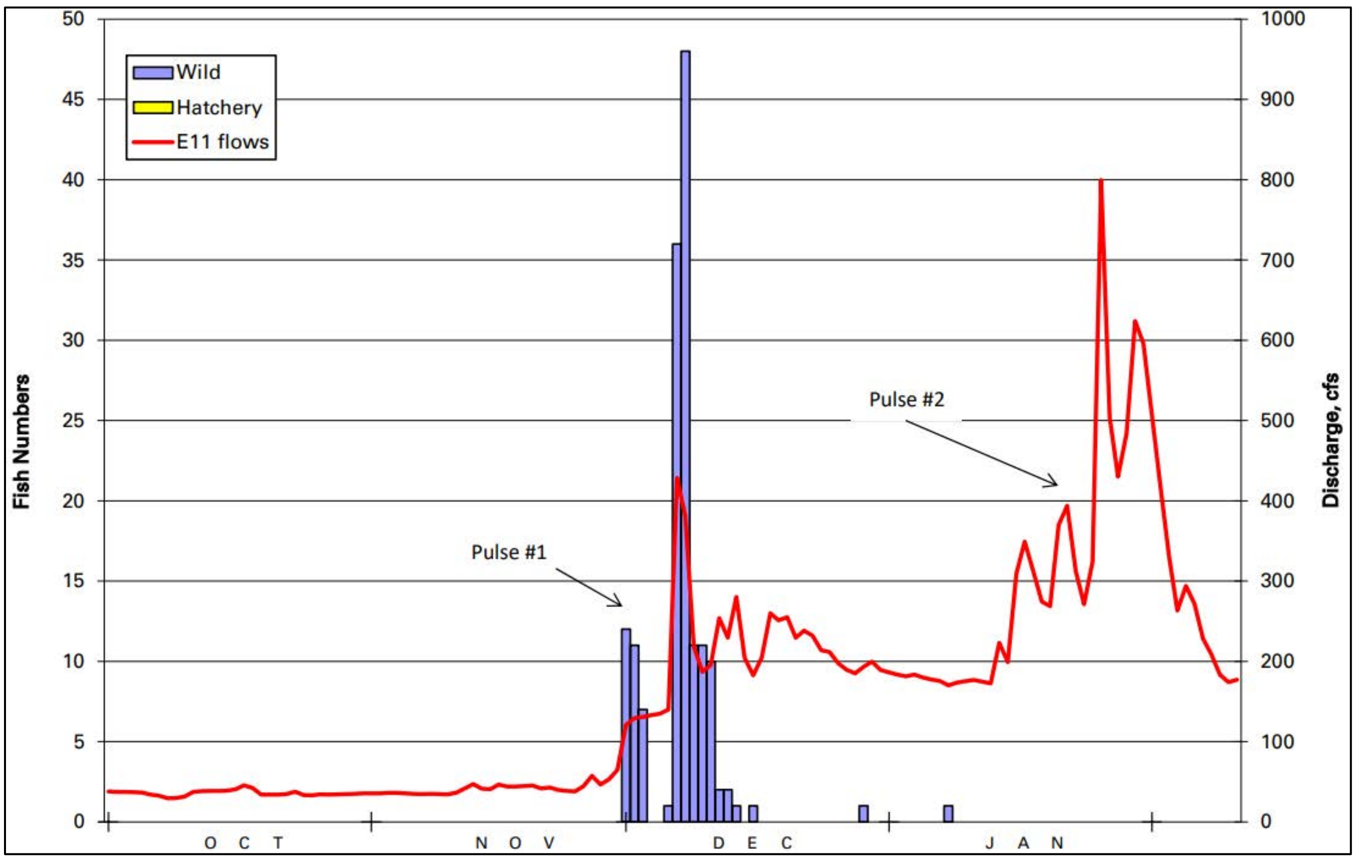
Source: PG&E 2019k



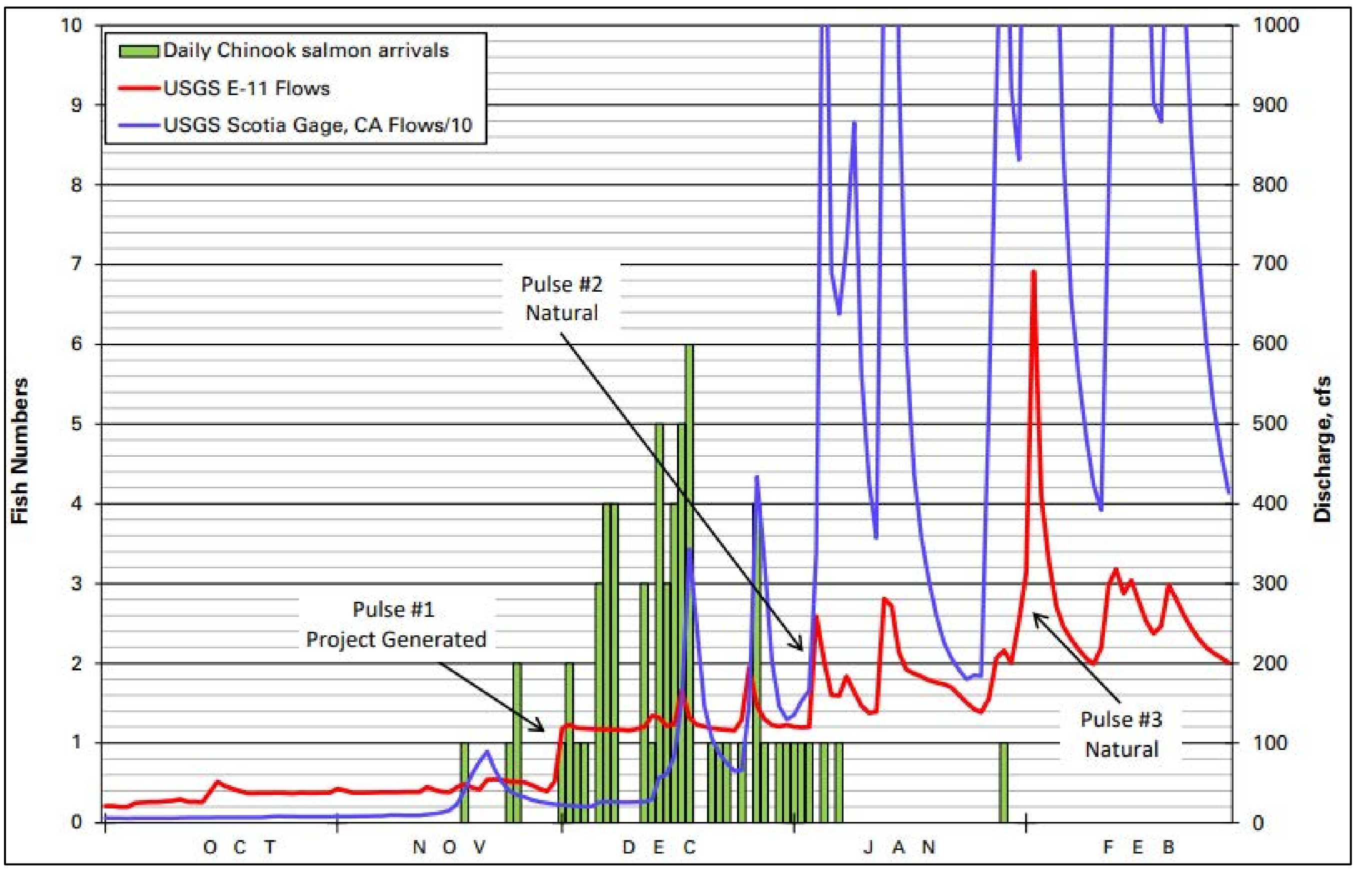
Source: PG&E 2020e

Figure 3.3.3-15. Daily arrivals of adult Chinook salmon at the Cape Horn Dam Fish Ladder, 2016/2017 (top), 2017/2018 (middle), and 2018/2019 (bottom).

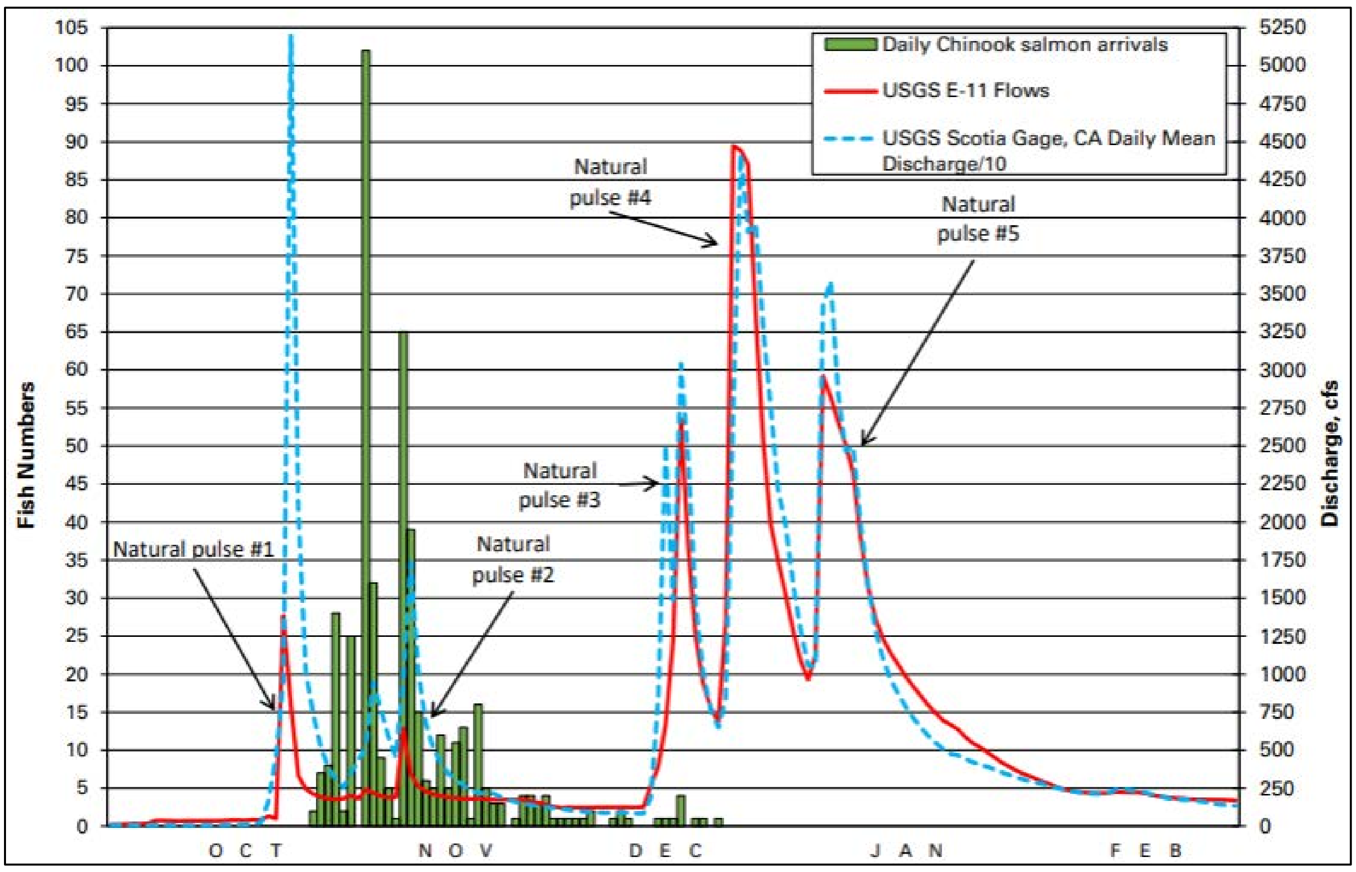
This Page Intentionally Left Blank



Source: PG&E 2021e



Source: PG&E 2022e



Source: PG&E 2023a

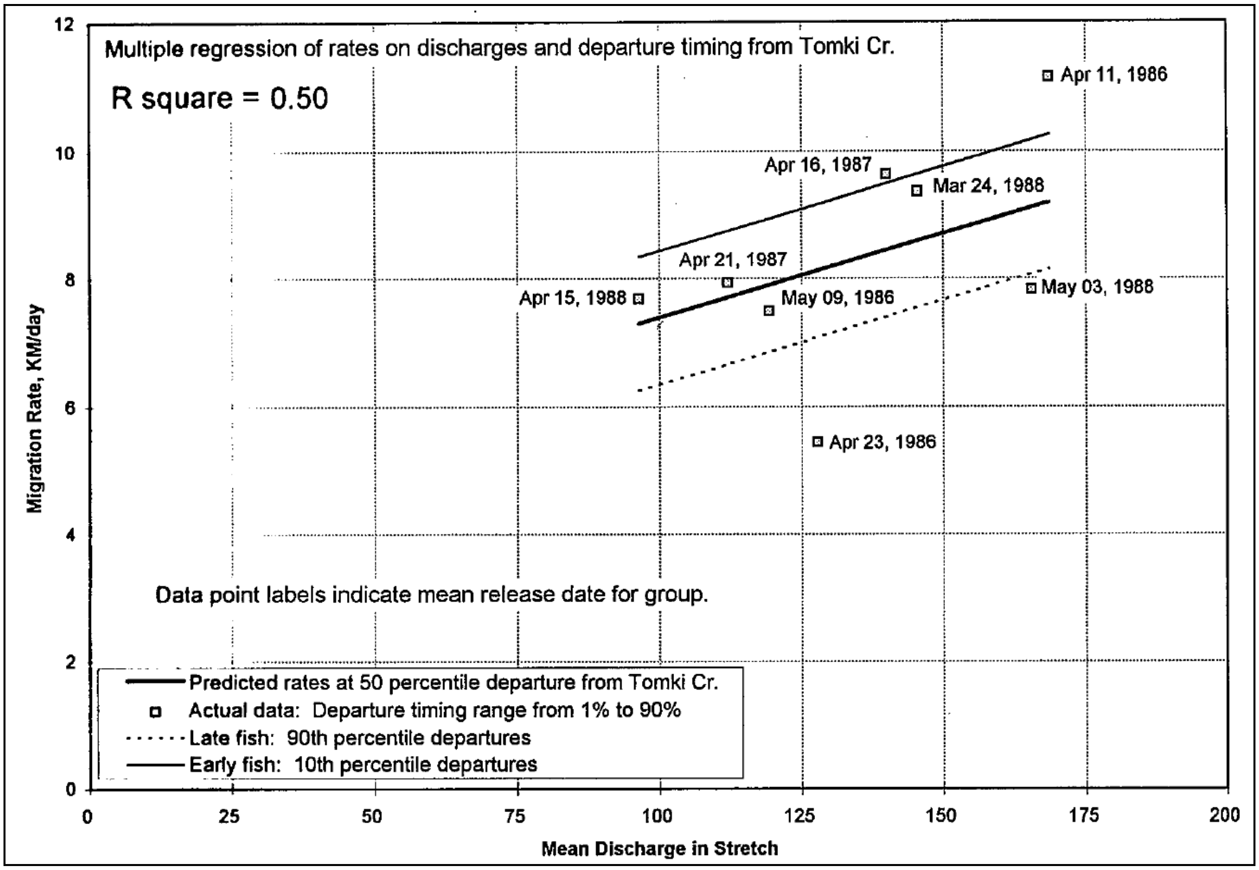
Figure 3.3.3-16. Daily arrivals of adult Chinook salmon at the Cape Horn Dam Fish Ladder, 2019/2020 (top), 2020/2021 (middle), and 2021/2022 (bottom).

This Page Intentionally Left Blank

Consistent with fall-run Chinook salmon life history, juvenile salmon emigrate from the upper Eel River in the spring. Juvenile salmon have not been captured or observed during any summer rearing monitoring surveys in the Eel River below Cape Horn Dam (PG&E 2016c; VTN 1982) or above Cape Horn Dam (PG&E 2016a; SEC 1998). Juvenile Chinook salmon were captured in the study area during spring outmigrant trapping conducted in 1980s and 1990s (SEC 1998; VTN 1982). Surveys from 1980 to 1992 captured and estimated production of juvenile Chinook salmon from spring downstream migrant trapping conducted at four trapping locations: Eel River above Cape Horn Dam, Eel River below Cape Horn Dam, Tomki Creek, and Eel River above Outlet Creek (SEC 1998). Chinook salmon estimates upstream of Cape Horn Dam ranged from 1,195 to 888,203; however, from 1990 to 1992, adult surveys did not document any significant spawning in the study area. Chinook salmon estimates downstream of Cape Horn Dam ranged from 6,448 to 1,243,280. These estimates of production should be viewed cautiously, since the downstream migrant trapping was designed primarily for assessing migration timing and speed of downstream movement relative to flow and water temperature, rather than producing production estimates (SEC 1998). Substantially different patterns of Chinook salmon downstream migration were observed in the Eel River above Cape Horn Dam compared to Tomki Creek (SEC 1998; VTN 1982).

During most years, the juvenile Chinook migration pattern from Tomki Creek was characterized by a strong pulse of movement in mid-April that rapidly declined after a few weeks. In contrast, downstream migration in the Eel River from above Cape Horn Dam was found to occur somewhat later and in a more protracted manner than in Tomki Creek. SEC (1998) calculated the period between the departure of 5 percent and 50 percent of emigrating Chinook in both Tomki Creek and the Eel River above Cape Horn Dam. For Tomki Creek, the average 5 percent to 50 percent departure window was 8 days from April 10 to April 17. For the Eel River above Cape Horn Dam, the average 5 percent to 50 percent departure window was 18 days from April 20 to May 7. The difference in emigration timing between Tomki Creek and the Eel River above Cape Horn Dam is attributed to the cooler temperatures and higher discharges in the Eel River above Cape Horn Dam. Maximum water temperatures were about 3 degrees Celsius (°C) cooler above Cape Horn Dam (14.7°C vs. 17.6°C) and discharges were over four times as great (235 cfs vs. 49 cfs) during the 5 percent to 50 percent window when compared to Tomki Creek (SEC 1998).

SEC (1998) also presented data on the rate of downstream movement of juvenile Chinook salmon between Tomki Creek and the Eel River above Outlet Creek, based on the recapture of fish leaving Tomki Creek marked with fluorescent dye. There was a positive correlation between migration transit rates and mainstem discharges from Tomki Creek to Outlet Creek at flows ranging from 97 to 169 cfs (mean regression migration rates were from approximately 7 km/day to 9 km/day, respectively) (Figure 3.3.3-17). The analysis was restricted to juvenile Chinook salmon migrants from Tomki Creek departing from late March to early May. Fish departing later in the Tomki Creek migration window (late April to early May) appeared to move more slowly than fish that departed earlier (late March to mid-April).



Source: SEC 1998: Figure 5.5-1

Figure 3.3.3-17. Predicted migration rates for juvenile Chinook salmon in the upper Eel River based on results from dye mark studies.

SEC (1998) concluded that juvenile Chinook that do not initiate their downstream migration until mid-May or later (generally fish from the Eel River below Scott Dam and a small minority of the Tomki Creek population) are more likely to encounter stressful thermal conditions in the lower Eel River, regardless of the magnitude of Project flow releases. VTN (1982) and SEC (1998) hypothesized that juvenile Chinook salmon emigrating from the study area late in the season were at significant risk due to stressful thermal conditions that develop during the early summer in the lower mainstem Eel River above the influence of the fog belt. However, relatively high returns of adult Chinook at VAFS between 2010 and 2011 and 2012 and 2013 following little or no spawning in Tomki Creek after implementation of the current license flow requirements suggests that other factors besides the existence and timing of an outmigration thermal barrier downstream may be contributing to the magnitude of adult returns.

The 1983 FERC Project license made 2,500 ac-ft of block water available to resource agencies for fisheries protection. Between 1985 and 1996, eight block water releases from Lake Pillsbury were made in the spring targeting enhanced downstream migration of juvenile Chinook salmon and steelhead. Since the 2004 FERC flow requirements were implemented (which also included block water), attempts have been made to benefit the downstream migration of juvenile Chinook salmon through spring-time block water releases and/or increasing the surface/bottom release ratios from Lake Pillsbury to increase downstream temperatures. In 2012, block water releases in combination with increased surface/bottom release ratios successfully encouraged the timely emigration of juvenile Chinook salmon. In 2013, not enough water was available in the reservoir to sustain surface releases from the radial gate. In 2014, surface releases were incorporated into the total release at Scott Dam at varying percentages to achieve target temperatures of about 15°C, resulting in a significant increase in emigration of juvenile Chinook salmon and steelhead (ERF 2016). From 2015 to 2023, a combination of block water release and/or warm surface water release strategies have been implemented to encourage timely emigration of juvenile Chinook salmon when adequate water supply was available.

Chinook are known to use the mainstem Eel River as a critical migration route for spawning (Figure 3.3.3-4). In the lower mainstem, Chinook spawning has been recorded in six tributaries—Wilson, Cuddeback, Fiedler, Cummings, Price, and Atwell creeks, which matches observed historical presence (CDFG 2010). Adult Chinook salmon will hold in the estuary and the Eel River near the Van Duzen River confluence until sufficient flows allow upstream migration. Chinook stranding and mortality have been observed in the Van Duzen River confluence area in early fall of some years (CDFG 2010). Upstream migration is restricted during dry periods in early fall, particularly in the Eel River above the Van Duzen River confluence.

Coho Salmon

Coho salmon are thought to use the mainstem Eel River primarily as a migration corridor for adult and juvenile fish as far upstream as Outlet Creek and its tributaries, which are approximately 30 mi. downstream of Cape Horn Dam (Figure 3.3.3-7). Tomki Creek (upstream of Outlet Creek) presumably does not currently support coho salmon, although the species was found there historically (NMFS 2014a). During the 1946 to 1947 spawning season, 47 adult coho salmon were recorded at VAFS, but since that time, they have only been recorded infrequently and in small numbers, most recently in 2010 and 2011 (NMFS 2014a). No juvenile coho salmon have been captured or observed during summer rearing monitoring surveys in the Eel River upstream or downstream of Cape Horn Dam (PG&E 2023a, 2023c; SEC 1998). Historically, coho salmon were also found in the lower Eel River in Palmer, Strongs, Wolverton Gulch, Cuddeback, Fiedler, Cummings, and Howe creeks and possibly in Rohner Creek (Figure 3.3.3-7). Historical records from 1964 show coho carcasses, as a result of a fish kill, found in the Eel River below Rohner Creek (CDFG 2010). Since 1990, coho have been observed in Cummings, Oil, Howe, Atwell, and Strongs creeks (CDFG 2010).

Adult coho typically enter fresh water from September through January to spawn. In the Eel River, arrival generally peaks in November and December (California Cooperative Anadromous Fish and Habitat Data Program [CalFish] 2018).

Coastal Cutthroat Trout

It is believed that Eel River cutthroat live out their entire life cycle in fresh or brackish water. Coastal cutthroat trout have been observed during salmonid population surveys in eight tributaries of the lower Eel River. Several occurrences have been reported in Strongs and North Fork Strongs creeks from 1984 to 1995. Historical records show cutthroat presence in the lower Eel River dating back to 1950 in Barber Creek. More recently (1994), their presence has been recorded in Wolverton Gulch at the Highway 36 Bridge (CDFG 2010). The Eel River is known to be the current southern extent of coastal cutthroat trout (Miller and Lea 1972). The Strongs Creek coastal cutthroat trout population is believed to represent the southernmost extent of the species (Gerstung 1984).

Non-Salmonid Native Species

Non-salmonid native fish species potentially found in the Eel River portion of the study area include green sturgeon, white sturgeon, tidewater goby, Pacific lamprey, western brook lamprey (*Lampetra richardsoni*), Western river lamprey (*Lampetra ayresii*), Pacific eulachon, longfin smelt, Sacramento sucker, Humboldt sucker (*Catostomus occidentalis humboldtianus*), sculpin, and stickleback. Of these species, only Pacific lamprey and Sacramento sucker have been regularly captured or observed during the various fish monitoring activities conducted in the upper mainstem Eel River (see Table 3.3.3-3). Lamprey, sculpin, and stickleback have regularly been captured and observed during fish monitoring surveys on the lower Eel River (CDFG 2010; see Table 3.3.3-3). Mapped occurrences of special-status fish species (longfin smelt and tidewater goby) are shown on Maps 3.3.3-7 a though e[4] where spatial data are available. Other recorded observations of non-salmonid native fish species in the study area are discussed below.

Physical habitat in the Eel River is suitable for sturgeon spawning and post-spawning holding (Stillwater Sciences and Wiyot Tribe 2017). Juvenile green sturgeon were reported to be captured in the mainstem Eel River during outmigrant trapping just upstream of the Middle Fork Eel River near Dos Rios (RM 119) from 1967 to 1970 (Puckett 1976). Lack of capture or observation during numerous years of summer monitoring (PG&E 2016c; SEC 1998) and outmigrant trapping studies (SEC 1998; VTN 1982) suggested that green sturgeon were unlikely to be present in the study area. However, a study by Stillwater Sciences and the Wiyot Tribe from 2014 through 2016 indicates that a spawning run of green sturgeon still occurs in the Eel River basin annually (Stillwater Sciences and Wiyot Tribe 2017). This result is significant given that the species was considered to be extirpated from the Eel River (Moyle 2002; NMFS 2010a).

Results of the Stillwater Sciences and the Wiyot Tribe (2017) study suggest that there may be spawning river fidelity for green sturgeon, which may suggest the possibility of an Eel River species sub-population. This is consistent with tagging and genetic studies that revealed limited mixing between spawners in the Klamath and Rogue rivers (Lindley et al. 2011; Stillwater Sciences and Wiyot Tribe 2017). This is further supported by previous genetic analysis that suggested an unidentified sub-population in the Northern DPS (Israel et al. 2004). Stillwater Sciences and the Wiyot Tribe (2017) hypothesized that the riverine portion of the Eel River estuary is likely not utilized as preferred feeding habitat based on over 20 individual sturgeon (tagged from other locations) in the ocean being detected 2 km from the mouth of the Eel River with no entry.

[4] Confidential maps are provided in Volume III.

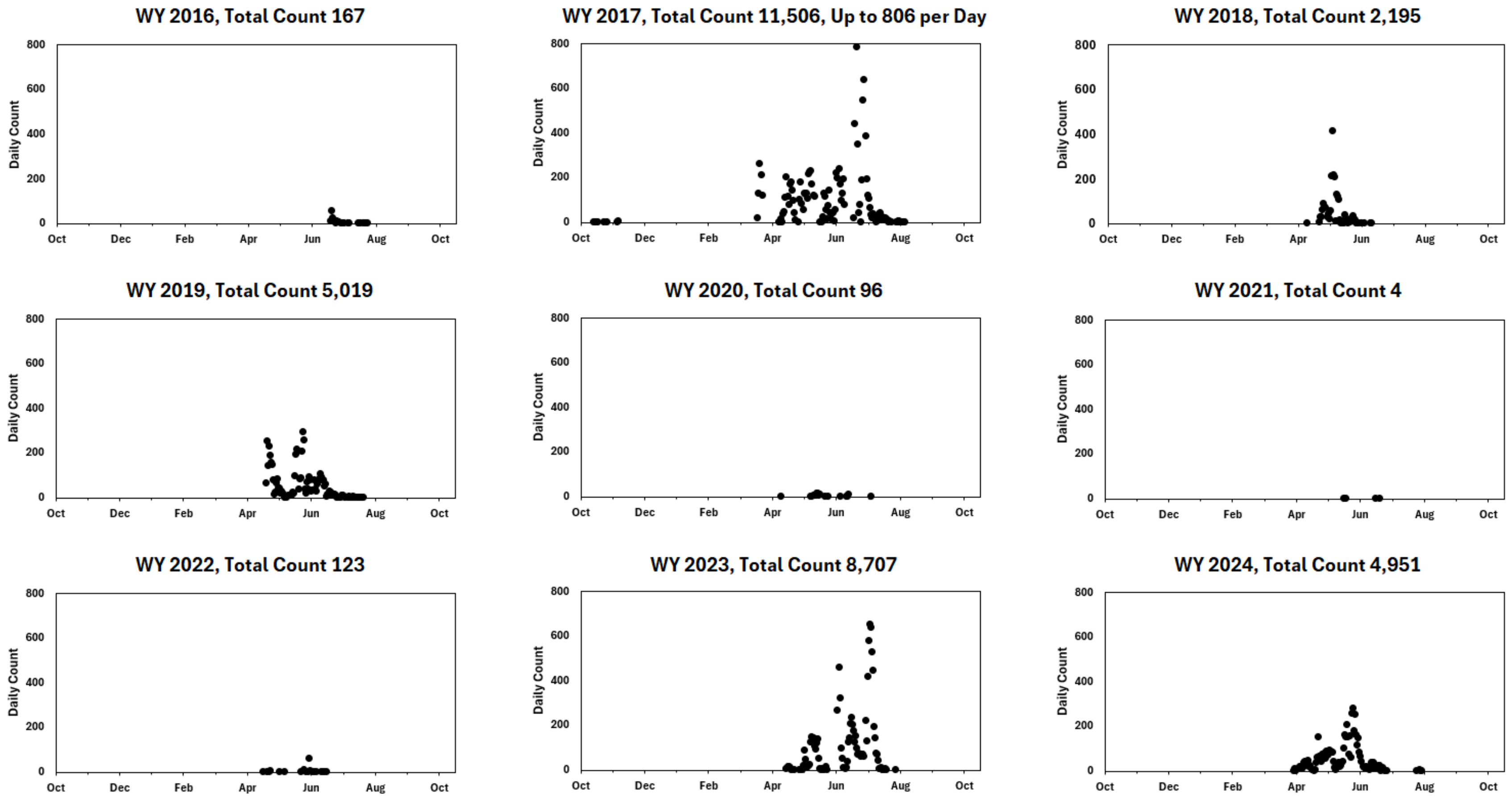
Adult and subadult white sturgeon have been documented in the Eel River estuary; however, there is no recent evidence of spawning activity in the river. It is reported that small runs of white sturgeon occurred in the Eel River historically, but it is unknown if successful spawning occurs currently (CDFW 2023, 2024b).

Pacific lamprey (and possibly other species of lamprey), mostly ammocoetes (i.e., larvae) or eyed juveniles, have been regularly captured during various fish monitoring activities, both below and above Cape Horn Dam (Butler 2012; CDFG 2010; PG&E 2016a, 2016c; SEC 1998; Stillwater Sciences 2010). In 2012, block water releases from Lake Pillsbury, in combination with increased surface/bottom release ratios, successfully encouraged adult lamprey to migrate upstream (ERF 2016). Holding and migratory adults are also commonly observed in the pool-and-weir fish ladder at Cape Horn Dam.

Incidental observations suggest that Pacific lamprey populations in the study area declined during the period between 1985 and 1996 (SEC 1998). It is possible that this decline was related to factors that also affected salmon and steelhead populations during this period, such as ocean conditions and pikeminnow introduction. Additionally, there have been widespread reports of a considerable decline in the abundance of Pacific lamprey migrating adults, spawning adults, and carcasses in the Eel River basin beginning around the 1950s (Stillwater Sciences 2010).

Passage of adult Pacific lamprey has been monitored at VAFS in the past decade. Since 2016, numbers of returning adult lamprey have varied significantly, ranging from over 10,000 adults in 2017 to 4 in 2021 and over 8,000 in 2023 (Figure 3.3.3-18). Annual adult Pacific lamprey upstream migration in the Eel River regularly occurs in the spring and summer, typically between April and August, comparable to that documented in other river systems. Spawning Pacific lamprey have been commonly observed in high numbers from late May through early July in the upper mainstem Eel River, with lower numbers captured in mid-March through April (Stillwater Sciences 2010). As observed in many lamprey species, run timing varies greatly within and between years, indicating that temperature and flow are key triggers influencing upstream migration timing (Moser et al. 2014). In the Columbia River, spawning migration of Pacific lamprey was observed to be strongly influenced by temperature, occurring earlier in warm years when flows were low and later in cold years when flows were high (Moser et al. 2014).

Western brook lamprey are also present in the study area. Western brook lamprey is a resident, non-parasitic species that has been documented above Lake Pillsbury (Moyle 2002) and using parts of the Eel River and numerous tributaries, including Outlet Creek (Stillwater Sciences 2010, 2014; Stillwater Sciences and Wiyot Tribe 2016). Western brook lamprey have been observed spawning in Outlet Creek from mid-March to mid-June, with a peak in late April to late May (Vladykov and Follett 2015) and with adult migration likely occurring in the preceding winter months.



Sources: PG&E 2017e, 2018e, 2019k, 2020e, 2021e, 2022e, 2023a, 2024b; Anderson, pers. comm., 2024

Figure 3.3.3-18. Daily counts of adult Pacific lamprey at Van Arsdale Fish Station, 2016–2024.

Western river lamprey, an intermediate-sized anadromous and parasitic species that is closely related to the western brook lamprey, may also be present in the study area, although only a single adult, captured at Cape Horn Dam in May 1992, has been reported in the Eel River basin (Moyle 2002). Western river lamprey typically migrate back into fresh water in the fall and spawn during the winter or spring months (CDFW 2015).

Neither western brook lamprey nor western river lamprey has been documented in the various fisheries studies conducted in the upper Eel River; however, captured ammocoetes were not identified to species during recent or past studies.

Introduced Species

Introduced non-native species that have been documented in Eel River portion of the study area include Sacramento pikeminnow, California roach (*Lavinia symmetricus*), green sunfish (*Lepomis cyanellus*), bluegill, largemouth bass, and brown bullhead (*Ameiurus nebulosus*) (California Trout et al. 2024; CDFG 2010; PG&E 2016a, 2016c; SEC 1998; VTN 1982). Of these, only pikeminnow and roach have been observed in relatively high densities. While all non-native species may have adverse ecological effects on native fishes, Sacramento pikeminnow have a large effect on salmonids, lampreys, and other native fishes in the Eel River through predation and competition for food and space (Nakamoto and Harvey 2003; Reese and Harvey 2002; White and Harvey 2001). Notably, these studies generally found that the effects of pikeminnow on native fishes in the Eel River increase as water temperature increases. Because of their overlap in time and space, steelhead and lamprey appear to be affected by pikeminnow more than other native species in the Eel River.

Pikeminnow were first detected in the Eel River in the late 1970s. Their spread through the drainage was hastened by the flood of February 1986. They now dominate much of the main channel habitat and are believed to have largely displaced juvenile steelhead from much of the limited rearing habitat in the mainstem Eel River and many of its larger tributaries. The effects of steelhead displacement by pikeminnow may have been more severe in the vicinity of the Project, where juvenile steelhead are believed to have been displaced from pool and run habitat above Cape Horn Dam and steelhead numbers in riffle habitat have been reduced. Most of the adult steelhead destined to return to VAFS spend a year or more as juveniles residing in the mainstem or tributary habitat between Scott and Cape Horn dams before going to the ocean[5]; thus, pikeminnow impacts on the juvenile steelhead population in this area likely has a significant impact on adult steelhead returns. Pikeminnow predation on downstream migrants is also a concern (SEC 1998).

Table 3.3.3-11 summarizes estimated linear densities of Sacramento pikeminnow at seven monitoring sites between Cape Horn Dam and the Middle Fork Eel River from 2005 to 2022 (PG&E 2006a–2018a, 2019g, 2020a–2023a). Pikeminnow densities were relatively high at each site in the study area during this period. Table 3.3.3-8 shows Sacramento pikeminnow populations

[5] Juvenile steelhead in the Eel River between Scott Dam and Van Arsdale Reservoir demonstrated rapid growth rates (approximately 0.8 millimeter [mm] per day) during much of the spring, summer, and fall, likely contributing to higher ocean survival. In contrast, fish rearing in the tributaries grew at significantly slower rates (SEC 1998).

in three index sections of pool, riffle, and run habitat sampled between Van Arsdale Reservoir and Scott Dam from 1990 to 2022.

In recent years, Native American Tribes and researchers have initiated programs to manage the non-native pikeminnow population in the South Fork Eel River (California Trout et al. 2024). This ongoing effort began in 2017 with the development and evaluation of approaches to suppress and monitor pikeminnow populations and recommendations for future study efforts. The Wiyot Tribe Natural Resources Department has continued to build on this effort and implemented the current project between 2021 and 2023 with the objectives to (1) remove invasive pikeminnow in the South Fork Eel River resulting in population decline; (2) improve pikeminnow management by filling biological data gaps; (3) evaluate and refine population control methods; (4) foster collaboration among the Tribe and Eel River stakeholders; and (5) build Wiyot Tribal capacity to conduct fisheries research, monitoring, and restoration in the Eel River basin (Wiyot Tribe Natural Resources Department 2024). In 2023, the Wiyot Tribe, in collaboration with the Bureau of Land Management, University of California Berkeley, Blue Lake Rancheria, and CalTrout, implemented a fish weir with a live trap intended to trap and/or prevent upstream migration of pikeminnow in the South Fork Eel River (Bureau of Land Management 2023). Additional efforts to suppress and monitor pikeminnow populations include tagging fish to track movement and growth, snorkel surveys, gillnetting and spearfishing, boat electrofishing, beach seining, and angling. From 2018 to 2023, 2,173 pikeminnow were removed from the South Fork Eel River due to the Wiyot Tribe's efforts (Wiyot Tribe Natural Resources Department 2024). Additionally, PG&E began implementing pikeminnow monitoring and suppression according to its Pikeminnow Adaptive Management and Suppression Operation Plan in 2019. These efforts included raft and boat electrofishing. Suppression efforts were concentrated in Van Arsdale Reservoir from 2020 to 2024 due to minimal catches below Scott Dam and Cape Horn Dam in 2019 (Figures 3.3.3-9 and 3.3.3-10). PG&E pikeminnow suppression was performed in Van Arsdale Reservoir twice monthly from June through September for a total of eight efforts each year (PG&E 2022a). From 2020 to 2024, PG&E's efforts removed 11,173 pikeminnow from Van Arsdale Reservoir[6] (PG&E 2022a, 2023d, 2024c; Anderson, pers. comm., 2024).

Historical Fish Stocking

SEC (1998) has summarized historical hatchery supplementation related to the upper Eel River and the Project, and the reader is directed to this source for additional information. SEC (1998) was the primary source for the information summarized below.

The Eel River has a long history of hatchery supplementation, including plantings of many stocks of anadromous salmonids originating from outside the basin, including the Sacramento and Klamath river basins. Stocking of Chinook salmon and steelhead began around 1900 and continues in some locations through the present, although hatchery practices and age of release have changed over the years. Hatchery supplementation of anadromous salmonids in the upper

[6] PG&E 2020–2024 pikeminnow data are provisional.

Eel River was thought to play a significant role in sustaining Chinook and steelhead populations in the upper Eel River, although little data exist to support this claim (SEC 1998).

Chinook stocking prior to 1960 mostly occurred in the lower Eel River and major tributaries downstream of the study s area (SEC 1998; Yoshiyama and Moyle 2010). Chinook stocking shifted to the mainstem Eel River upstream of Outlet Creek (RM 126.0) in the 1970s, when more than 886,000 Chinook were planted at VAFS (SEC 1998). In the 1980s, stocking shifted to the South Fork Eel River, although substantial stocking continued in Outlet Creek and the Eel River below Outlet Creek. In the early 1990s, most stocking shifted away from the upper Eel River and occurred in the South Fork Eel and Van Duzen rivers.

Similar to the stocking history for Chinook, steelhead stocking prior to 1960 was mostly in the lower Eel River. Between 1965 and 1995, more than 1.4 million steelhead were planted in the mainstem Eel River above Outlet Creek, mostly at VAFS (SEC 1998). The origin of steelhead planted included in-basin and out-of-basin stocks, including from the Mad River. The size of steelhead smolts planted generally increased after the 1970s.

Between 1971 and 1982, steelhead were routinely planted in the Eel River near VAFS (SEC 1998). After 1982, steelhead stocking was more limited and included an assessment of the success of each release group. Adult return rates to VAFS between 1985 and 1994 ranged from 0.71 percent to 6.88 percent. Return rates were used as an indication of combined effects of ocean conditions and other factors and to verify calculations of wild adult return rates (SEC 1998).

The stocking program for both Chinook salmon and steelhead in the Upper Eel River Watershed was eliminated in recent years. As a consequence, Chinook salmon and steelhead of hatchery origin have not been documented in returns to VAFS with any consistency since the 2006 to 2007 and 2008 to 2009 spawning seasons, respectively. The Eel River is no longer stocked with Chinook salmon and steelhead. Lake Pillsbury was stocked with hatchery trout in the summer of 2024.

Amphibians and Reptiles

A list of representative common amphibian and aquatic reptile species and a list of special-status amphibian and aquatic reptile species that are known, or have the potential, to occur in the Eel River, as well as in tributaries to the Eel River, are provided in Table 3.3.3-14 and Table 3.3.3-15. The tables also describe regulatory status for special-status species, habitat associations, historical and recent occurrences, and potential distribution of each species. A discussion of five special-status amphibian and aquatic reptile species with confirmed occurrences in the mainstem Eel River or nearby tributaries—foothill yellow-legged frog, northern red-legged frog, coastal tailed frog, southern torrent salamander, and northwestern pond turtle—is also provided below. Additional discussion of these special-status species is provided in Section 3.3.3.11.

Native amphibians and aquatic reptiles that could be present in the Eel River include western toad (*Anaxyrus boreas*), Sierran treefrog (*Pseudacris sierra*), California newt (*Taricha torosa*), rough-skinned newt (*Taricha granulosa*), and aquatic garter snake (*Thamnophis atratus*). None of these species has special status. Non-native North American bullfrog (*Lithobates catesbeianus*) occurs in the study area. Non-native red-eared slider (*Trachemys scripta elegans*) may also be present, although the species has not been documented.

Data on species occurrences were obtained from targeted field surveys conducted in 2018 (PG&E 2019a), CDFW CNDDB (CDFW 2024a), the USFWS's IPaC tool, and the California Freshwater Species Database (Howard et al. 2015b). The California Freshwater Species Database is a compilation of current (post-1980) and historical observations (pre-1980) compiled from multiple sources (including the CNDDB and museum records). The IPaC identified northwestern pond turtle as occurring in the study area (USFWS 2024).

Table 3.3.3-14. Examples of non-listed amphibian and aquatic reptile species that may occur in the study area (not a comprehensive list).

Common Name ***Scientific Name***	**Habitat Associations**
Amphibians	
Western toad *Anaxyrus boreas*	Breeds in marshes, creeks, river margins, ponds, lake margins, and wet meadows. Post-metamorphic life stages are terrestrial using riparian woodlands, forests, and grasslands.
North American bullfrog *Lithobates catesbeianus*	Non-native; occurs mostly in permanent water bodies—ponds, lakes, rivers, and streams—usually with aquatic vegetation.
Sierran treefrog *Pseudacris sierra*	Breeds in slow streams, permanent and seasonal ponds, ditches, lakes, shallow wetlands, and wet meadows. Can occur far from water.
Rough-skinned newt *Taricha granulosa*	Adults have winter terrestrial and spring/summer aquatic phases; reproduction is aquatic, with eggs attached to vegetation and rocks in stream pools, river margins, off-channel water bodies, ponds, and reservoirs. Larval stage lasts several months. On land, species is found in moist habitats under woody debris, in rock crevices, and in small mammal burrows.
California newt *Taricha torosa*	Adults have winter terrestrial and spring/summer aquatic phases; reproduction is aquatic, with eggs attached to vegetation and rocks in stream pools, off-channel water bodies, ponds, and reservoirs. Larval stage lasts several months. On land, species is found in moist habitats under woody debris, in rock crevices, and in small mammal burrows.
Reptiles	
Aquatic garter snake *Thamnophis atratus*	Associated with all types of wetland and aquatic habitats.
Red-eared slider *Trachemys scripta elegans*	Non-native; streams, rivers, ponds, lakes, swamps, marshes, ditches, agricultural canals, and park lakes. Prefers slow-moving water, soft-bottom substrates, abundant aquatic vegetation, and basking sites.

Sources: AmphibiaWeb 2024; Catenazzi and Kupferberg 2013; CDFW 2024a; Dever 2007; Fellers 1996; Howard et al. 2015b; P. Kubicek, pers. comm., 2017; Kupferberg (personal observation); PGE 2017g, 2019a; Stebbins and McGinnis 2012

Table 3.3.3-15. Special-status amphibian and aquatic reptile species and their documented presence in the study area by reach.

Species	Listing Status	Presence by Reach								
		Eel River above Lake Pillsbury	Rice Fork above Lake Pillsbury	Lake Pillsbury	Eel River, Scott Dam to Van Arsdale Reservoir (Cape Horn Dam)	East Branch Russian River and Tributaries	Eel River, Cape Horn Dam to Middle Fork Eel River	Middle Fork Eel River to Eel River Estuary	Eel River Estuary to Ocean	Eel River Tributaries
Coastal tailed frog *Ascaphus truei*	SSC	–	–	–	–	–	–	–	–	X
Northwestern pond turtle *Actinemys marmorata*	SSC, FPT, FSS (MNF)	X	X	X	X	X	X	X	–	X
Northern red-legged frog *Rana aurora*	SSC, FSS	–	–	–	–	–	–	X	X	–
Sothern torrent salamander *Rhyacotriton variegatus*	SSC	–	–	–	–	–	–	–	–	X[a]
Foothill yellow-legged frog (Northwest/North Coast Clade and North Coast DPS) *Rana boylii*	SSC, FSS (MNF)	X	X	–	X	X	X	X	–	X

Sources: CDFW 2024a; PG&E 2019a

[a] Southern torrent salamanders have been observed in tributaries to the lower Eel River.

Notes: FPT = Federal Proposed Threatened
FSS = Forest Service Sensitive
MNF = Mendocino National Forest
SSC = California Species of Special Concern

Coastal Tailed Frog (SSC)

Coastal tailed frog is an SSC and has been documented in the tributaries of the lower Eel River, although not in the mainstem. Larvae were observed in a small stream near the confluence with the lower Eel River in 2013, just north of the South Fork Eel River confluence (CDFW 2024a).

Coastal tailed frog occurrences are shown in Map 3.3.3-7, and documented presence by reach in the study area is provided in Table 3.3.3-15.

Northwestern Pond Turtle (SSC, FSS [MNF], FPT)

Northwestern pond turtle, an SSC, a FSS in the MNF, and a federal proposed threatened species, has historically been observed throughout the mainstem Eel River and its tributaries (CDFW 2024a; Fellers 1996; PG&E 2017g). In summer and early fall 2018, adult and juvenile turtles were commonly observed in the Eel River between Scott Dam and Cape Horn Dam, between Cape Horn Dam and the Middle Fork Eel River confluence (Dos Rios), and in tributaries including Benmore Creek, Bucknell Creek, Outlet Creek, Salt Creek, Scott Creek, Soda Creek, and Tomki Creek (PG&E 2019a).

Northwestern pond turtle occurrences in the Eel River and its tributaries are shown in Map 3.3.3-7, and documented presence by reach in the study area is provided in Table 3.3.3-15.

Northern Red-Legged Frog (SSC)

Northern red-legged frog, an SSC, has been documented in the lower Eel River and its tributaries (CDFW 2024a). This species breeds in the winter and spring, with breeding typically peaking in February (Zeiner et al. 1990). Several egg masses have been observed near the Eel River estuary in February and March (CDFW 2024a). Egg masses hatch in 3 to 4 weeks, and larval development typically takes 11 to 20 weeks for tadpoles to reach metamorphosis (Zeiner et al. 1990), indicating aquatic life stages of this species may be present from winter through late summer.

Mapped occurrences in the Eel River and its tributaries are shown in Map 3.3.3-7, and documented presence by reach in the study area is provided in Table 3.3.3-15.

Southern Torrent Salamander (SSC)

Southern torrent salamander, an SSC, has been documented in tributaries of the lower Eel River, although not in the mainstem. One adult was observed in a small stream near the confluence with the lower Eel River in 2013, just north of the South Fork Eel River confluence (CDFW 2024a).

Southern torrent salamander occurrences are shown in Map 3.3.3-7, and documented presence by reach in the study area is provided in Table 3.3.3-15.

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of special-status biological resources and qualify as Confidential Information (18 CFR § 385.1112). Disclosure of such information could be harmful to these resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.3-7a–e. CONFIDENTIAL Special-status aquatic species documented in the study area (excluding salmonids)

The maps identified above are included in Volume III, Exhibit E Privileged Information—Biological Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and are labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Foothill Yellow-Legged Frog (SSC, FSS [MNF])

Foothill yellow-legged frog, an SSC and a FSS in the MNF, is currently known to occur from the Eel River and its tributaries upstream of Lake Pillsbury, downstream of Scott Dam, below Van Arsdale Reservoir to the Middle Fork Eel River confluence, and in the Eel River estuary (CDFW 2024a; Fellers 1996; P.F. Kubicek, pers. comm., 2017; PG&E 2017, 2019a).

During 2018 surveys, various stages of foothill yellow-legged frogs (adults, juveniles, and tadpoles) were observed in the mainstem Eel River between Scott Dam and the Middle Fork Eel River and in tributaries such as Benmore Creek, Bucknell Creek, Outlet Creek, Soda Creek, and Tomki Creek (PG&E 2019a). Breeding was also documented at the transition between the Eel River and the upstream end of Van Arsdale Reservoir (PG&E 2019a).

Foothill yellow-legged frog breeding is strongly correlated with a seasonal decrease in streamflow and increasing air and water temperatures in the spring and early summer, with 10°C regarded as the minimum temperature required for oviposition (Hayes et al. 2016). Rates of embryonic development are also strongly correlated to water temperature; at water temperatures of 16 to 20°C in the South Fork Eel River, hatching occurred over a 1- to more than 3-week period, with colder water temperatures resulting in longer times to hatching (Kupferberg et al. 2011).

Records of early-season water temperature from 2016 to 2023 in the upper Eel River indicate that water temperatures below Scott Dam (Gage E2) often reach the breeding threshold in late March to early April, occasionally delayed by wet water year types or cool springs (Figure 3.3.3-19 through Figure 3.3.3-21). Egg masses in various stages of development were observed in the mainstem Eel River from late April through mid-May during 2018 surveys conducted in support of the relicensing effort (PG&E 2019a).

Once hatched, the duration of the foothill yellow-legged frog tadpole period is 3 to 4 months (Zweifel 1955) and varies in relation to both temperature and the quantity and quality of algal food (Catenazzi and Kupferberg 2013; Kupferberg et al. 2011). In 2018, tadpoles were observed beginning in early June. Tadpoles are present in the mainstem Eel River throughout most of the summer months into the early fall (PG&E 2019a).

Mapped occurrences of foothill yellow-legged frog in the Eel River and its tributaries are shown in Map 3.3.3-7, and documented presence by reach in the study area is provided in Table 3.3.3-15.

This Page Intentionally Left Blank

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	9.2	8.7	8.9	10.9	9.7	10.1	13.2	11.7	12.3	15.6	14.2	14.9
2	9.3	8.8	9.0	10.6	9.5	9.9	13.1	11.9	12.4	15.2	14.3	14.8
3	9.5	8.7	9.1	10.5	9.6	10.0	13.6	11.7	12.7	15.5	14.1	15.0
4	9.4	8.8	9.1	10.5	9.5	10.0	14.6	13.4	13.9	15.3	14.6	15.0
5	10.4	8.8	9.5	10.7	9.5	10.1	14.3	13.5	13.9	15.7	14.6	15.2
6	10.3	8.8	9.6	10.8	9.7	10.2	13.8	13.3	13.5	16.0	14.7	15.4
7	10.2	9.3	9.7	10.8	9.7	10.1	14.0	13.1	13.4	16.2	15.0	15.6
8	9.8	9.2	9.4	10.7	9.9	10.2	13.9	12.9	13.4	15.9	14.8	15.4
9	9.2	9.0	9.1	10.2	9.9	10.1	14.3	13.0	13.4	16.2	14.7	15.5
10	9.2	8.9	9.1	10.4	9.9	10.2	14.3	13.1	13.5	16.0	15.2	15.6
11	9.1	8.8	8.9	10.5	10.0	10.2	14.4	13.1	13.5	16.1	15.2	15.7
12	9.1	8.9	8.9	10.7	10.0	10.3	14.4	13.1	13.6	16.2	15.0	15.7
13	9.0	8.8	8.9	11.0	9.9	10.3	14.5	13.0	13.7	16.5	15.2	15.9
14	9.2	8.7	8.9	10.1	9.8	10.0	14.3	12.8	13.4	16.1	15.1	15.7
15	9.1	8.8	8.9	10.7	10.0	10.3	14.4	12.7	13.4	16.1	14.9	15.6
16	9.5	8.7	9.0	11.1	9.9	10.4	14.4	13.0	13.5	16.0	15.3	15.7
17	9.9	8.8	9.1	11.1	9.9	10.4	14.3	13.1	13.6	16.3	15.5	15.9
18	10.0	8.9	9.3	11.2	10.1	10.6	14.3	13.2	13.6	16.9	15.5	16.1
19	10.3	9.1	9.7	11.2	10.2	10.6	14.3	13.0	13.5	16.9	15.6	16.2
20	11.1	9.0	10.0	11.1	10.1	10.5	13.9	13.1	13.4	17.0	15.5	16.3
21	10.4	8.8	9.6	10.9	10.3	10.6	13.8	13.2	13.5	17.2	15.8	16.4
22	10.9	9.6	10.2	10.9	10.4	10.5	14.3	13.5	13.8	17.3	15.9	16.6
23	11.1	9.4	10.3	11.4	10.3	10.7	14.0	13.2	13.6	17.1	16.0	16.6
24	11.5	9.5	10.4	11.1	10.3	10.6	14.3	13.5	13.9	17.2	15.9	16.7
25	11.9	10.0	10.8	11.9	10.2	10.9	14.8	13.4	13.9	17.5	16.1	16.9
26	11.4	9.9	10.6	11.7	10.8	11.2	15.0	13.8	14.2	17.8	16.0	16.9
27	11.2	10.2	10.5	12.2	10.5	11.3	15.0	13.5	14.2	17.7	16.4	17.1
28	11.0	10.4	10.7	13.0	10.6	11.7	15.6	13.6	14.4	17.9	16.6	17.3
29	10.8	10.0	10.3	13.2	11.2	11.9	15.2	13.8	14.5	18.1	16.5	17.3
30	11.0	9.9	10.2	13.3	11.3	12.2	15.3	13.8	14.6	18.4	16.6	17.5
31	10.9	9.7	10.0				15.6	14.2	14.8			

Source: PG&E 2017b

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	8.0	7.3	7.5	11.2	9.9	10.4	13.5	10.8	11.9	16.1	14.6	15.3
2	8.2	7.1	7.4	11.9	9.7	10.6	13.2	12.0	12.5	15.1	12.9	14.4
3	8.0	6.9	7.3	11.8	9.9	10.5	13.1	12.0	12.4	13.9	12.7	13.2
4	7.3	7.0	7.2	10.9	9.9	10.4	13.5	12.0	12.7	13.8	12.8	13.2
5	7.1	6.7	6.9	11.1	10.3	10.7	13.2	12.0	12.5	13.8	12.8	13.3
6	7.3	7.0	7.1	11.2	10.4	10.7	13.7	11.8	12.6	14.0	12.9	13.4
7	7.6	7.1	7.3	10.7	9.9	10.4	11.7	10.7	11.2	13.6	12.9	13.2
8	7.9	7.1	7.4	10.4	9.9	10.2	11.7	10.2	10.8	13.5	13.0	13.2
9	8.3	7.2	7.6	10.9	9.9	10.2	12.4	10.4	11.1	14.0	12.9	13.3
10	9.5	7.5	8.3	10.8	9.8	10.2	11.8	10.7	11.2	13.7	12.6	13.1
11	9.2	7.8	8.5	10.9	10.4	10.6	11.5	10.6	11.0	13.5	12.8	13.1
12	10.7	8.0	9.1	10.9	10.2	10.6	11.4	10.5	10.9	14.0	12.9	13.3
13	9.9	8.0	8.9	10.5	9.7	10.2	12.1	10.5	11.2	14.3	12.9	13.5
14	10.0	8.2	8.7	11.4	9.9	10.5	12.1	10.6	11.2	14.4	13.0	13.6
15	9.9	8.6	9.1	10.7	9.7	10.1	12.4	10.7	11.4	14.5	13.1	13.7
16	12.4	9.0	10.1	10.4	10.1	10.3	11.9	10.9	11.4	14.8	13.5	14.1
17	11.1	9.0	9.9	10.6	9.8	10.2	12.7	11.0	11.6	15.0	13.7	14.3
18	10.6	9.8	10.2	10.7	9.8	10.2	12.4	11.1	11.7	15.3	13.9	14.6
19	10.9	9.9	10.4	10.6	9.8	10.2	12.8	11.5	12.0	15.5	14.3	14.7
20	11.0	10.0	10.4	12.2	10.1	10.9	12.8	11.6	12.0	15.6	14.0	14.7
21	11.0	8.5	10.1	11.5	10.3	10.9	13.0	11.5	12.2	15.5	14.2	14.7
22	10.1	7.4	9.3	11.0	9.9	10.6	17.7	12.0	14.8	15.2	14.0	14.7
23	7.8	7.0	7.3	12.0	9.8	11.0	17.0	15.2	16.2	15.6	14.2	14.8
24	7.6	7.3	7.4	11.4	10.3	10.9	16.4	14.8	15.7	15.6	14.1	14.8
25	8.3	7.3	7.6	11.4	10.5	11.0	16.1	15.0	15.6	15.7	14.3	14.9
26	9.4	7.5	8.6	11.4	10.4	11.1	15.9	15.1	15.4	15.5	14.0	14.8
27	10.4	8.8	9.6	11.7	10.7	11.2	16.1	15.0	15.7	15.5	13.8	14.7
28	10.6	9.3	10.0	11.5	10.4	10.9	15.4	14.6	15.1	15.4	13.9	14.7
29	10.6	9.5	10.0	11.4	10.2	10.7	15.1	14.2	14.7	15.4	14.0	14.7
30	10.6	9.4	10.0	12.3	10.2	11.1	15.2	14.1	14.7	15.5	14.1	14.8
31	11.3	9.5	10.2				15.9	14.6	15.1			

Source: PG&E 2018b

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	7.8	7.1	7.3	8.6	7.5	8.1	10.8	9.5	10.1	15.1	13.7	14.3
2	7.3	6.8	7.0	8.6	7.8	8.2	10.8	9.6	10.1	15.7	13.8	14.6
3	7.4	6.9	7.0	8.8	7.8	8.2	11.0	9.7	10.2	15.9	14.4	15.0
4	7.2	6.6	6.8	8.7	7.7	8.1	10.9	9.8	10.3	15.7	14.4	14.9
5	7.3	6.6	6.8	8.3	8.0	8.2	10.8	9.9	10.3	15.5	14.0	14.6
6	7.4	6.5	6.9	10.5	8.1	9.1	11.0	10.0	10.4	15.5	14.1	14.7
7	7.3	6.6	6.9	10.2	9.7	10.0	11.1	9.9	10.4	15.6	14.0	14.7
8	7.6	6.9	7.2	11.1	9.7	10.4	11.2	10.0	10.5	15.4	13.9	14.5
9	7.5	6.7	7.0	11.3	10.2	10.6	11.3	10.0	10.6	14.9	13.8	14.2
10	7.6	6.9	7.2	10.5	9.1	9.8	11.3	9.9	10.5	15.0	13.5	14.1
11	7.7	6.7	7.1	10.3	9.1	9.6	11.5	10.0	10.6	15.4	13.4	14.3
12	7.6	6.9	7.2	10.7	9.0	9.9	11.3	10.0	10.5	15.8	13.7	14.7
13	7.6	7.0	7.4	9.9	8.2	9.0	13.5	10.1	11.7	15.7	14.1	14.9
14	7.7	7.0	7.2	10.4	8.6	9.3	15.8	12.4	14.0	16.1	14.5	15.2
15	7.4	6.7	7.0	9.8	9.3	9.6	18.3	14.9	16.1	15.6	14.2	14.8
16	7.4	6.9	7.2	10.2	9.6	9.9	16.5	15.9	16.1	15.5	13.9	14.5
17	7.9	6.9	7.3	10.0	9.3	9.6	16.8	15.1	16.0	14.5	12.8	13.7
18	7.7	6.8	7.2	9.4	8.8	9.0	16.4	14.9	15.4	13.8	12.3	12.9
19	7.7	6.8	7.2	10.0	8.8	9.3	16.8	14.6	15.8	13.7	11.9	12.6
20	7.5	7.1	7.3	10.7	8.9	9.6	16.4	15.0	15.6	13.7	12.0	12.7
21	7.7	7.2	7.4	10.0	9.0	9.5	16.7	13.8	15.4	13.8	11.7	12.6
22	8.1	7.5	7.7	10.2	9.3	9.6	14.9	13.5	14.3	13.9	11.9	12.8
23	7.7	7.0	7.3	10.4	9.3	9.8	15.2	13.9	14.4	14.1	12.2	13.0
24	8.2	7.1	7.6	10.5	9.2	9.7	15.3	13.9	14.4	14.3	12.4	13.2
25	8.2	7.0	7.5	10.6	9.2	9.8	14.4	14.0	14.1	14.3	12.2	13.1
26	8.1	7.0	7.6	10.7	9.4	9.8	14.9	13.8	14.2	14.1	12.0	13.0
27	8.5	7.4	7.8	10.5	9.4	9.8	15.3	13.7	14.4	14.3	12.3	13.1
28	8.5	7.5	8.0	10.1	9.4	9.7	15.1	13.8	14.4	13.9	12.0	12.8
29	8.6	7.5	8.0	10.1	9.5	9.8	15.5	13.9	14.6	14.0	12.0	12.9
30	8.5	7.4	7.9	10.7	9.4	9.9	15.0	13.7	14.4	14.1	12.2	13.1
31	8.6	7.6	8.0				14.8	13.5	14.1			

Source: 2019h

Figure 3.3.3-19. Spring and early summer 2016 (top), 2017 (middle), and 2018 (bottom) water temperatures in the Eel River downstream of Scott Dam (PG&E E-2 Gage Site).

This Page Intentionally Left Blank

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	7.3	7.1	7.2	10.6	8.8	9.7	12.8	11.6	12.2	15.4	14.0	14.5
2	7.5	7.1	7.4	10.4	9.3	10.0	12.6	11.2	11.8	15.2	14.0	14.5
3	7.7	7.2	7.5	9.9	9.2	9.5	11.9	11.1	11.5	15.9	14.9	15.4
4	7.8	7.1	7.4	10.1	8.8	9.7	11.5	11.0	11.2	16.1	15.0	15.5
5	8.0	7.5	7.8	10.3	8.9	10.0	12.7	11.0	11.6	16.3	15.3	15.7
6	8.0	7.7	7.8	10.2	9.9	10.1	11.8	10.8	11.4	15.5	14.5	15.1
7	8.1	7.7	7.9	10.2	9.9	10.0	11.6	10.6	11.0	15.7	14.1	14.9
8	8.2	7.8	7.9	10.1	9.2	9.8	11.6	10.6	11.1	15.9	14.8	15.3
9	7.9	7.6	7.8	10.6	9.1	9.8	11.5	10.6	11.1	15.3	14.3	14.8
10	7.9	7.5	7.7	10.7	10.0	10.2	11.5	10.6	11.0	15.4	14.0	14.7
11	8.2	7.6	7.8	10.8	10.0	10.3	11.6	10.7	11.1	15.7	14.4	14.9
12	8.2	7.6	7.9	10.4	9.9	10.2	11.6	10.6	11.1	15.4	14.6	14.9
13	8.2	7.6	7.9	10.5	9.7	10.0	11.6	10.5	11.0	15.6	14.3	15.0
14	8.2	7.4	7.7	10.6	9.7	10.1	11.3	10.7	11.0	15.5	14.8	15.1
15	8.5	7.4	7.7	10.5	9.8	10.3	14.0	10.8	11.3	15.8	13.6	15.0
16	9.3	7.5	8.0	11.1	10.3	10.6	15.9	14.3	15.5	15.5	13.3	14.2
17	10.2	7.7	8.7	11.2	10.2	10.6	16.0	15.3	15.5	15.2	14.3	14.6
18	10.2	8.2	8.9	11.2	10.5	10.7	16.3	15.6	16.1	15.4	14.1	14.7
19	10.4	8.1	9.2	11.8	10.6	11.2	15.7	14.8	15.2	15.5	14.2	14.8
20	9.5	8.0	9.2	12.9	10.7	11.6	14.9	13.7	14.4	15.1	13.8	14.5
21	10.4	8.3	9.1	12.2	11.0	11.6	14.5	13.7	14.1	14.4	13.2	13.8
22	9.2	8.1	8.8	13.0	11.2	12.0	15.4	14.0	14.6	14.4	13.4	13.8
23	10.0	9.0	9.4	13.7	11.7	12.6	15.0	14.0	14.5	14.6	13.2	13.8
24	10.1	8.7	9.5	13.4	12.4	12.8	14.4	13.7	14.0			
25	9.4	8.6	9.1	13.5	11.9	12.7	14.5	12.9	13.7	14.6	13.2	13.8
26	9.6	8.4	9.0	14.5	12.1	13.0	14.5	12.9	13.7	14.5	13.1	13.7
27	9.2	8.3	8.7	13.5	12.0	12.8	13.9	13.2	13.5	14.4	13.1	13.6
28	9.2	8.3	8.9	13.6	12.3	12.9	13.6	12.9	13.3	14.6	13.1	13.7
29	9.4	8.9	9.1	13.7	12.2	12.9	14.0	12.8	13.4	14.6	13.1	13.7
30	9.8	8.7	9.1	13.4	12.5	13.0	15.4	13.9	14.5	14.7	13.3	13.8
31	10.0	8.7	9.1				15.4	14.2	14.7			

Source: PG&E 2020b

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	8.6	7.7	8.1	10.5	9.3	9.9	12.5	11.0	11.7	15.2	14.6	14.9
2	9.3	8.2	8.8	10.6	9.2	9.9	12.3	11.2	11.6	15.6	14.7	15.1
3	9.4	8.1	8.7	10.7	9.4	10.0	12.6	11.0	11.6	16.1	14.6	15.3
4	9.4	8.3	8.8	10.5	9.7	10.0	12.6	10.9	11.6	16.2	14.5	15.4
5	9.6	8.5	9.0	10.5	9.7	10.1	12.7	11.0	11.8	16.0	14.6	15.3
6	9.3	8.6	8.8	10.6	9.7	10.1	12.8	11.2	12.0	16.1	14.4	15.1
7	9.3	8.6	8.8	11.0	10.0	10.3	12.9	11.1	12.0	15.3	14.5	15.0
8	9.3	8.5	8.8	11.2	10.0	10.5	13.0	11.6	12.2	16.2	14.3	15.3
9	9.3	8.4	8.7	11.2	10.1	10.5	13.2	11.7	12.3	16.6	14.9	15.7
10	9.7	8.3	8.9	11.6	10.3	10.8	13.1	11.7	12.2	16.8	14.9	15.8
11	9.9	8.5	9.1	11.3	10.2	10.7	12.0	11.7	11.8	16.7	15.2	15.9
12	10.1	8.6	9.2	11.4	10.5	10.8	12.3	11.8	12.1	16.3	15.3	15.7
13	9.8	8.5	9.0	11.3	10.3	10.8	12.2	11.6	11.9	16.4	15.2	15.7
14	9.5	8.8	9.1	11.4	10.4	10.8	12.5	11.8	12.1	17.0	14.9	15.9
15	9.0	8.5	8.7	11.3	10.4	10.8	13.2	11.9	12.3	16.4	15.2	15.8
16	9.3	8.5	8.9	11.6	10.6	11.0	12.7	12.0	12.3	17.1	14.9	15.9
17	9.1	8.8	8.9	11.8	10.4	11.0	12.6	12.2	12.3	17.0	15.3	16.0
18	9.6	8.9	9.1	11.9	10.5	11.1	12.4	12.1	12.3	17.5	15.1	16.1
19	9.8	8.8	9.2	12.0	10.7	11.1	13.2	11.9	12.5	17.6	15.2	16.3
20	9.8	8.8	9.2	11.4	10.6	11.0	13.3	12.2	12.8	17.8	15.4	16.5
21	10.0	8.7	9.3	12.1	10.5	11.2	13.8	12.5	13.1	17.8	15.8	16.7
22	10.1	8.9	9.4	12.0	10.6	11.2	14.1	12.9	13.4	18.0	16.1	17.0
23	10.1	9.0	9.4	12.6	10.9	11.6	14.1	12.7	13.6	18.2	16.1	17.1
24	9.7	9.1	9.4	12.8	10.8	11.6	14.3	13.2	13.8	18.2	16.1	17.1
25	10.0	9.1	9.3	12.5	11.0	11.6	14.7	13.3	14.1	18.2	16.1	17.1
26	10.1	8.9	9.4	12.7	11.1	11.7	14.9	13.5	14.3	18.5	16.2	17.3
27	9.9	9.0	9.4	12.8	10.9	11.7	15.1	13.8	14.5	18.3	16.1	17.2
28	10.0	9.1	9.5	13.0	11.2	11.9	15.1	14.1	14.7	17.9	16.1	16.9
29	10.0	9.3	9.6	12.6	11.4	11.9	15.3	14.2	14.8	17.8	15.9	16.9
30	9.9	9.5	9.7	12.5	11.2	11.7	15.0	14.1	14.6	18.1	16.0	17.0
31	10.4	9.4	9.9				15.0	14.0	14.7			

Source: PG&E 2021b

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	8.5	7.7	8.0	10.4	9.4	9.8	12.7	11.4	12.0	18.8	16.3	17.5
2	8.6	7.6	8.0	10.5	9.3	9.8	13.4	11.4	12.2	19.0	16.2	17.5
3	8.4	7.7	8.0	10.2	9.4	9.8	13.9	11.6	12.3	18.9	16.5	17.6
4	8.5	7.6	8.0	10.7	9.6	10.0	14.0	11.7	12.6	19.0	16.7	17.6
5	8.7	7.7	8.1	10.6	9.6	10.0	13.6	11.7	12.6	18.9	16.5	17.6
6	8.7	7.9	8.2	10.7	9.6	10.0	13.3	11.8	12.5	18.7	16.7	17.5
7	8.7	7.7	8.1	10.7	9.6	10.0	13.6	12.0	12.8	18.5	16.5	17.2
8	8.4	7.8	8.1	10.9	9.6	10.1	13.8	11.8	12.8	18.5	16.1	17.1
9	8.4	7.7	8.1	11.0	9.6	10.1	14.5	12.4	13.3	18.6	15.9	17.0
10	8.4	7.7	8.0	10.9	9.6	10.2	13.8	12.8	13.5	18.5	15.7	17.0
11	8.8	7.9	8.2	11.3	9.7	10.4	14.5	12.9	13.6	18.2	16.4	17.2
12	8.8	7.9	8.3	11.0	9.8	10.3	14.8	13.0	13.8	19.0	17.0	17.9
13	9.1	8.0	8.4	11.5	9.8	10.5	14.9	13.0	14.0	19.5	17.2	18.1
14	8.3	7.9	8.1	11.4	10.0	10.5	15.1	13.2	14.2	19.4	17.2	18.1
15	9.0	7.8	8.4	11.4	9.8	10.5	14.8	13.5	14.2	19.1	16.5	17.7
16	9.1	8.5	8.7	11.4	10.2	10.6	15.2	14.1	14.7	19.2	16.8	17.9
17	9.1	8.4	8.6	11.6	10.1	10.7	15.7	13.8	14.8	19.6	17.2	18.3
18	9.1	8.5	8.8	11.6	10.0	10.8	15.7	13.9	14.8	19.7	17.2	18.4
19	9.0	8.3	8.6	11.7	10.2	10.8	15.7	13.7	14.8	19.8	17.4	18.5
20	9.0	8.2	8.5	12.0	10.3	10.9	16.1	13.9	14.7	19.8	17.4	18.5
21	9.1	8.2	8.6	12.0	10.3	11.1	16.0	14.1	15.0	19.9	17.6	18.6
22	9.5	8.3	8.8	11.9	10.4	11.1	16.2	14.6	15.4	20.0	17.2	18.5
23	9.8	9.1	9.3	12.0	10.6	11.1	16.7	14.9	15.6	20.0	17.3	18.6
24	9.5	9.0	9.3	11.5	10.7	11.0	16.8	15.0	15.8	20.0	17.3	18.6
25	10.5	9.4	9.8	11.5	10.5	10.9	17.6	15.3	16.1	20.0	17.3	18.6
26	10.3	9.1	9.6	11.8	10.5	11.0	17.5	15.4	16.2	20.7	17.9	19.2
27	10.4	9.2	9.7	12.3	10.7	11.3	17.6	15.2	16.3	20.8	18.0	19.3
28	10.5	9.3	9.8	12.4	10.9	11.5	18.1	15.8	16.7	20.9	18.0	19.3
29	10.4	9.2	9.7	12.4	11.1	11.6	18.2	15.9	16.9	21.0	17.8	19.3
30	10.3	9.2	9.7	12.5	11.3	11.8	18.4	15.7	17.1	21.1	18.3	19.5
31	10.4	9.3	9.8				18.8	16.1	17.4			

Source: PG&E 2022b

Figure 3.3.3-20. Spring and early summer 2019 (top), 2020 (middle), and 2021 (bottom) water temperatures in the Eel River downstream of Scott Dam (PG&E E-2 Gage Site).

This Page Intentionally Left Blank

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	8.0	7.4	7.7	10.5	9.3	9.8	14.9	12.8	13.7	15.3	13.8	14.5
2	8.0	7.3	7.6	10.5	9.5	10.0	14.6	13.4	13.9	15.3	13.7	14.4
3	7.9	7.5	7.7	10.4	9.3	9.8	15.1	13.5	14.2	15.2	14.0	14.4
4	8.3	7.6	7.9	10.3	9.7	9.9	15.2	13.6	14.3	14.6	13.9	14.2
5	8.4	7.8	8.1	10.4	9.6	10.0	14.6	13.8	14.3	15.6	14.1	14.6
6	8.6	7.8	8.1	10.9	9.6	10.1	15.2	14.3	14.7	15.5	13.7	14.5
7	8.7	7.8	8.2	10.9	9.6	10.2	15.3	14.3	14.7	15.5	14.1	14.7
8	8.8	7.8	8.2	10.9	9.8	10.3	14.7	13.9	14.3	15.6	14.1	14.9
9	9.1	8.2	8.7	11.3	9.6	10.3	14.8	13.9	14.2	15.4	14.4	14.9
10	9.3	8.6	8.9	11.0	9.6	10.2	14.3	13.6	14.0	15.8	14.7	15.2
11	9.2	8.3	8.7	11.3	9.9	10.5	14.6	13.2	13.7	16.0	14.9	15.5
12	9.1	8.4	8.7	11.2	9.8	10.3	14.4	13.1	13.6	15.6	14.8	15.3
13	9.3	8.7	8.9	11.2	10.0	10.6	15.1	13.1	13.9	16.1	14.3	15.1
14	9.4	8.5	8.9	11.0	10.4	10.7	16.3	14.2	15.0	15.9	14.5	15.2
15	9.7	9.0	9.2	11.2	10.5	10.8	16.0	14.2	15.0	16.1	14.6	15.3
16	9.6	8.7	9.1	11.9	10.6	11.1	16.2	14.1	15.1	16.1	14.5	15.2
17	9.6	8.8	9.1	11.8	10.7	11.1	17.5	14.7	15.9	15.7	14.7	15.1
18	9.5	8.6	9.0	11.5	10.8	11.1	17.3	14.3	16.1	16.0	14.3	15.2
19	9.3	8.9	9.1	11.7	11.1	11.3	15.2	13.7	14.3	16.2	14.5	15.3
20	9.5	8.5	9.0	11.3	11.1	11.2	15.9	13.4	14.5	16.5	14.7	15.5
21	9.9	8.8	9.4	11.7	11.0	11.3	16.0	14.0	14.8	16.5	15.0	15.7
22	10.2	9.2	9.6	11.6	10.9	11.2	15.3	13.5	14.3	16.7	14.9	15.8
23	10.3	9.3	9.7	13.6	11.1	12.1	16.0	14.0	14.7	16.7	15.3	15.9
24	10.1	9.1	9.5	13.7	12.2	12.7	15.6	14.0	14.7	16.7	15.3	15.9
25	10.3	9.3	9.7	14.1	12.5	13.1	15.7	14.4	14.9	16.7	15.3	15.9
26	10.1	9.2	9.6	14.7	12.7	13.6	15.4	14.0	14.7	16.8	15.3	16.1
27	10.0	9.3	9.6	14.7	13.2	13.7	15.7	14.3	14.8	16.8	15.3	16.1
28	9.8	9.4	9.7	14.6	13.0	13.8	15.1	14.2	14.5	16.8	15.2	16.0
29	10.5	9.4	9.9	14.7	13.2	13.9	15.2	13.7	14.4	16.9	15.3	16.1
30	10.1	9.5	9.8	14.2	12.9	13.4	15.3	13.6	14.4	17.1	15.4	16.3
31	10.4	9.3	9.8				15.3	13.6	14.4			

Source: PG&E 2023b

	March			April			May			June		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
1	6.3	5.5	5.8	7.9	7.0	7.4	14.2	12.1	13.3	11.6	11.0	11.3
2	6.6	5.7	6.0	7.8	7.1	7.4	13.8	12.8	13.4	11.7	11.0	11.3
3	6.3	5.6	5.8	8.2	7.1	7.8	13.3	12.8	13.0	11.8	11.2	11.4
4	5.7	5.3	5.6	8.5	7.9	8.2	14.1	12.6	13.3	11.9	11.2	11.5
5	5.8	5.5	5.6	8.4	7.7	7.9	14.0	13.5	13.7	11.9	11.3	11.6
6	5.7	5.5	5.6	8.0	7.6	7.8	13.9	13.1	13.5	12.0	11.4	11.7
7	5.9	5.5	5.7	8.3	7.6	7.9	13.4	12.4	13.1	12.3	11.2	11.8
8	6.2	5.6	5.8	9.2	7.8	8.3	13.1	12.4	12.8	12.3	11.3	11.8
9	5.7	5.5	5.5	9.6	8.1	8.7	14.5	12.8	13.4	12.3	11.6	11.9
10	5.7	5.4	5.5	10.2	8.0	8.8	13.8	12.8	13.3	12.5	11.4	11.9
11	6.0	5.7	5.8	9.7	7.8	8.7	14.8	13.0	13.8	12.5	11.7	12.0
12	6.0	5.8	5.9	11.3	7.7	10.2	16.4	13.9	14.8	12.8	11.9	12.3
13	6.3	5.7	6.1	11.1	9.2	10.1	17.8	14.8	16.0	12.9	11.5	12.2
14	6.9	6.0	6.4	10.3	9.3	9.7	16.6	13.8	15.6	12.9	11.6	12.3
15	6.7	6.4	6.6	10.3	9.2	9.5	16.1	13.9	14.9	13.1	11.5	12.3
16	7.1	6.4	6.7	11.6	9.3	10.2	16.4	14.3	15.0	12.9	11.5	12.3
17	7.5	6.7	6.9	10.9	9.0	10.0	15.7	13.9	14.7	13.0	11.7	12.4
18	7.7	6.7	7.1	10.4	9.0	10.0	15.7	13.5	14.6	13.1	11.7	12.4
19	7.6	6.8	7.3	11.1	9.9	10.4	15.7	14.1	14.8	13.2	11.4	12.4
20	7.5	6.7	7.1	11.5	10.1	10.7	15.7	14.4	14.9	13.3	11.3	12.3
21	8.3	7.1	7.6	12.7	10.5	11.3	15.8	14.6	14.9	13.2	11.9	12.4
22	7.8	7.5	7.7	12.1	10.6	11.3	15.3	14.1	14.7	13.3	11.8	12.5
23	8.1	7.4	7.7	13.2	10.7	11.9	14.9	13.6	14.3	13.5	11.9	12.7
24	8.0	7.5	7.8	12.4	11.1	11.8	14.4	13.4	13.8	13.5	11.9	12.7
25	8.0	7.5	7.7	12.8	11.6	12.0	13.8	12.5	13.2	13.5	11.9	12.7
26	7.8	7.2	7.5	13.5	11.8	12.4	13.3	12.3	12.7	14.0	12.3	13.1
27	7.5	6.9	7.2	14.0	12.3	13.0	12.8	11.8	12.3	14.1	12.2	13.1
28	7.3	6.8	7.0	14.7	12.9	13.5	12.1	11.6	11.8	14.0	12.4	13.2
29	7.7	7.0	7.3	15.1	13.2	13.9	12.3	11.3	11.7	14.2	12.5	13.3
30	7.7	7.0	7.3	14.3	11.2	13.2	11.9	10.9	11.4	14.4	12.7	13.5
31	7.3	6.9	7.1				11.7	11.0	11.3			

Source: PG&E 2024a

Figure 3.3.3-21. Spring and early summer 2022 (top) and 2023 (bottom) water temperatures in the Eel River downstream of Scott Dam (PG&E E-2 Gage Site).

This Page Intentionally Left Blank

3.3.3.5 Eel River Estuary

Physical Environment

The Eel River estuary is composed of approximately 50 square miles of tidal flats and wetlands plus approximately 7 mi. of the mainstem Eel River, which is separated from the ocean by a barrier beach (i.e., spit) that typically remains open to tidal exchange year-round. For this analysis, the estuary portion of the Eel River is defined as the 100-year Federal Emergency Management Agency (FEMA) floodplain downstream of the Van Duzen confluence, except on the north side of the river, the boundary is the levee and highway along the river, which then widens to the 100-year floodplain in the lower portion of the estuary. In these types of estuaries, mouth closures are a function of river outflow, tidal currents, and wave forces. Due to continual high discharge from the Eel River, mouth closures are rare. The mean annual flow into the estuary is approximately 5.4 million ac-ft, with the highest measured annual flow at 12.6 million ac-ft in 1983 and the lowest at 0.4 million ac-ft in 1977 (CDFG 2010). A review of U.S. Geological Survey (USGS) gaging station data shows no evidence of the Eel River drying up and not discharging freshwater flows into the estuary and out the mouth. One report of a mouth closure was found for April 1988, with the closure lasting approximately 3 weeks (CDFW 2020).

The Eel River has one of the largest sediment yields per area in the country due to naturally erosive steep terrain, extreme precipitation, and historical logging activities (CDFG 2010; Ritter 1972). The average annual sediment yield is 29.7 million tons and is highly dependent on river discharge (Ritter 1972); during a 10-year period from 1958 to 1967, the Eel River at Scotia discharged an annual sediment yield of approximately 31.4 million tons per year (Brown and Ritter 1971). In 1964, a large riverine event flooded the estuary and deposited large volumes of sediment that filled historically deep channels and raised the riverbed elevation within the estuary and main estuary channel. While some of this sediment has since eroded away, the channel and pools have yet to recover to their original depths. The Eel River estuary is relatively flat and tends to accumulate sediment from the upstream, steeper portions of the river (CDFG 2010).

Tides enter the estuary via the mouth and are mixed diurnally, with two high and two low tides of unequal height occurring within an approximate 24-hour period. A tidal signature can be observed above Fernbridge, and it has been noted that the effect of tides can extend to the confluence with the Van Duzen River (Van Kirk 1996). There is an approximate 1-hour delay in high tides between the mouth of the river and Fernbridge (CDFG 2010). Tides entering the estuary are generally restricted to the main channels and slough by levees and tidegates constructed by settlers in the late 1800s and early 1900s. Consequently, these structures have significantly altered the natural tidal connectivity, prism, and drainage patterns between slough channels, freshwater streams, and surrounding wetlands.

Aquatic Habitat

The Eel River estuary provides a variety of aquatic habitats such as tidal flats, sloughs, marshes, and seasonal wetlands that supports resident and migratory waterfowl and provide important habitat for coho and Chinook salmon, steelhead, and coastal cutthroat trout. Cock Robin Island, which is located approximately 2 mi. upstream of where the river meets the Pacific Ocean, provides essential fish habitat, including spawning habitat for California Coastal Evolutionarily Significant Unit (ESU) Chinook salmon, Southern Oregon and Northern California Coasts ESU coho salmon and breeding, feeding, and refugia for their young.

Fish Passage Barriers

Degraded estuarine habitat conditions have contributed to the substantial population declines of all salmonid species that historically used the Eel River (ERF 2016). Fish passage barriers that occur in the Eel River estuary include shallow channel depths and sedimentation, reduction in floodplains, and insufficient water flow. Additionally, physical hydrologic barriers such as levees, culverts at road-stream crossings, and tidegates can restrict and, in some cases, impair natural tidal inundation and habitat migration (CDFG 2010; California Trout et al. 2024). Dikes, levees, and other water control structures are known barriers that limit upland coastal marsh migration when sea level rises (Schlosser and Eicher 2012). Restoring tidal prisms by upgrading or removing physical barriers like tidegates would allow for historical habitat connection and provide necessary passage for focal species (California Trout et al. 2024).

Reduced connectivity to estuarine habitat, generally because of sedimentation and frequently attributed to anthropogenic land use and low summer flows, is known to cause barriers to fish passage for Chinook and coho salmon, steelhead, Pacific lamprey, and green sturgeon (California Trout et al. 2024). Limited passage due to insufficient flows can limit connectivity to spawning grounds, causing long periods of holding in the estuary and resulting stress to salmonids, especially in years with elevated water surface temperatures. Carrying capacity for adult salmonids can be limited by loss of channel depth, resulting in stressful holding times in the estuary before rains allow for upstream passage.

Aquatic Community

Benthic Macroinvertebrates

BMI sampling has not been historically conducted in the Eel River. See Section 3.3.18 for a discussion of marine BMIs that may be present in the Eel River estuary.

Aquatic Molluscs

Freshwater portions of the Eel River estuary are within the historical range of the western pearlshell mussel and the California floater (Howard et al. 2015a). For a discussion of marine molluscs that may be present, see Section 3.3.18.

Fish Community

A variety of native and introduced fish species are known, or have the potential, to occur in the Eel River estuary (see Table 3.3.3-3). The regulatory status, habitat associations, historical and recent occurrences, and potential distribution of each species are included in Table 3.3.3-3. This section describes freshwater and anadromous fish that are likely to or are known to occur in the Eel River estuary. An expanded discussion on eight special-status fish species that are known to occur in the estuary (coho salmon, Chinook salmon, steelhead, cutthroat trout, Pacific lamprey, tidewater goby, longfin smelt, and green sturgeon) is provided below. Section 3.3.18 provides a full description of species that are likely to occur in the Eel River estuary.

Data on species occurrences were obtained from the CNDDB (2024), iNaturalist (2024), and available scientific research and literature (Cannata and Hassler 1995; CDFG 2010; Monroe et al.1974; Murphy and De Witt 1951; NMFS 2002; Schlosser and Eicher 2012). Native fish, including the stickleback, Sacramento sucker, and sculpin, have been captured in the Eel River estuary according to historical reports (Cannata and Hassler 1995; CDFG 2010; iNaturalist 2024; Puckett 1973). The Eel River estuary is a critical spawning migration route for native special-status species such as coho salmon, Chinook salmon, steelhead, and cutthroat trout. Additionally, the Eel River estuary is a critical nursery area for juvenile salmonids. Studies from 1951, 1977, and 1995 recorded the presence of juvenile Chinook from spring to fall, coho salmon from spring through summer, and steelhead year-round (Schlosser and Eicher 2012).

Coho salmon occur in the Eel River estuary. Spawning runs of adult coho salmon are reported to enter the estuary from November through February (Schlosser and Eicher 2012). Presence of juvenile coho in December and February suggests that the estuary provides important refuge for coho that might be washed out of tributaries during high-flow events or that coho naturally use the estuary during winter months. Coho also use the estuary as a holding area to acclimate during migration and are assumed to move through the estuary quickly during upstream migrations (CDFG 2010).

A single juvenile coho was captured in December 1994 in the lower estuary and again in 1995 during a large flood event (CDFG 2010). Coho salmon have been documented migrating and spawning in the Francis Creek tributary of the Salt River, which is a tributary of the Eel River that enters the Eel River within 1 mi. of the Pacific Ocean. There are recent records of young-of-year and juvenile coho salmon in the vicinity of the estuary (iNaturalist 2024). Occurrences have also been recorded in the nearby Humboldt Bay estuary dating back to 1984 with 37 live males and 7 live females observed from 2004 to 2005 (CDFW 2024a).

Once-abundant Chinook salmon populations have historically relied on the Eel River estuary for essential habitat. Present populations are not precisely known, but Eel River Chinook salmon numbers are likely less than 5 percent of the historical estimate (NMFS 2002). Adult Chinook salmon hold in the estuary until high-flow events allow for passage into spawning habitat upriver. Juvenile salmon will use the estuary to acclimate to seawater and feed and grow before migration to the ocean (Cannata and Hassler 1995; CDFG 2010). Spawning runs of adults will enter the estuary in August through January (Schlosser and Eicher 2012). Multiple occurrences of Chinook have been reported in nearby Humboldt Bay as recently as 2016 (CDFW 2024a).

The Eel River estuary has a known run of steelhead, with historical spawning habitat found in connected streams. Adult steelhead are found in the estuary year-round, generally separated into winter-run (November to April) and summer-run populations (March to June) (Schlosser and Eicher 2012). Multiple occurrences were recorded in the Eel River estuary in 2019, and a run of over 4,000 steelhead was documented during 2020 surveys (CDFW 2024a). Additionally, the affected area overlaps with designated critical habitat for steelhead.

Historically the Eel River estuary supported coastal cutthroat trout, whose southern distribution terminates at the Eel River (California Trout et al. 2024). Multiple occurrences of coastal cutthroat trout have been recorded in the Eel River estuary and nearby Humboldt Bay, with records from 1973 to present (CDFW 2024a).

The Eel River estuary has historically supported Pacific lamprey, with occurrences recorded in 1951, 1974, 1977, and 1995 (Cannata and Hassler 1995; Monroe et al. 1974; Murphy and De Witt 1951; Puckett 1977). Multiple occurrences of Pacific lamprey were observed in nearby Humboldt Bay in 2014 and 2016 (CDFW 2024a; iNaturalist 2024).

The Eel River estuary overlaps with designated critical habitat for tidewater goby, which is a Species of Special Concern (SCC) and federally listed as endangered. Tidewater gobies use the diverse habitats of the Eel River estuary year-round for spawning, feeding, and rearing (CDFG 2010; Schlosser and Eicher 2012). Tidewater gobies were last recorded in 2012, when 66 adults and 9 larvae were found (CDFW 2024a). Critical habitat and CNDDB occurrences of tidewater goby within the Eel River estuary are shown in Map 3.3.3-7.

In addition to anadromous salmonids, numbers of other migratory species documented from the Eel River estuary, including longfin smelt, green sturgeon, and white sturgeon, are far below historical numbers.

There are occurrences of longfin smelt in the Eel River estuary and lower mainstem dating back to 1956. Between 2003 and 2005, 12 adult longfin smelt were collected in the estuary (CDFW 2024a). A number of occurrence of longfin smelt in the estuary/lower Eel River are documented in (CDFG 2009). The estuary provides excellent feeding and rearing opportunities for juvenile Northern DPS green sturgeon (Stillwater Sciences and Wiyot Tribe 2017). Adult and subadult green and white sturgeon are documented to occur in the estuary, although there is no recent evidence of white sturgeon spawning activity in the Eel River. White sturgeon, based on Klamath River studies, would most likely occur in the estuary or lowermost mainstem of a river. The last known occurrence of white sturgeon was detected in Humboldt Bay in 2020 (iNaturalist 2024).

Although the Eel River is officially designated as part of the Northern DPS of green sturgeon, given its proximity to Humboldt Bay, which is documented feeding habitat for the Southern and Northern DPSs, it is possible that any green sturgeon in the Eel River estuary could be from the Southern or Northern DPS or a mix of both (Stillwater Sciences and Wiyot Tribe 2017). For more discussion on the Southern DPS green sturgeon, see Section 3.3.18. In 2015, five green sturgeon were tagged in the Eel River and detected in the Eel River estuary later that year, spending multiple days holding in the estuary during outmigration. All five green sturgeon tagged in the Eel River were genetically analyzed and determined to be associated with the Northern DPS (Stillwater Sciences and Wiyot Tribe 2017). In 2023, one green sturgeon carcass was observed along the Humboldt Coastline just south of the mouth of the Eel River estuary (iNaturalist 2024). Tagged individuals were detected in the Humboldt Bay estuary from 2006 to 2016, with one individual caught in a trawl net in 2020 (CDFW 2024a).

Amphibians and Reptiles

A list of amphibian and aquatic reptile species that are known, or have the potential, to occur in the Eel River estuary is provided in Table 3.3.3-14. The regulatory status, habitat associations, historical and recent occurrences, and potential distribution of each species are included in the table. Additional details about northern red-legged frog and northwestern pond turtle, which are special-status amphibian and aquatic reptile species that may occur in the estuary, is provided below.

Species occurrence data were obtained from the CNDDB (CDFW 2024a), iNaturalist (2024), and local biological resource information (CDFW 2020).

Northern red-legged frogs have been documented breeding within freshwater-dominant areas of the Eel River estuary, and there are numerous recent records of this species in the vicinity of the estuary (CDFW 2024a; iNaturalist 2024). Occurrences of northern red-legged frog within the Eel River estuary are shown in Map 3.3.3-7.

Although northwestern pond turtles have not been observed in the estuary, they have been reported in the vicinity (CDFW 2024a; iNaturalist 2024). This species could inhabit fresh and brackish water areas in the estuary.

Additional native amphibians and aquatic reptiles that could be present in freshwater-dominant areas of the Eel River estuary include western toad, Sierran treefrog, California newt, rough-skinned newt, and garter snakes. None of these species has special status.

3.3.3.6 Lake Pillsbury

Under existing conditions, Lake Pillsbury is a relatively small eutrophic reservoir (U.S. Environmental Protection Agency [USEPA] 1978) that has been in existence for approximately 100 years. The current gross storage capacity of the reservoir is 76,876 ac-ft (PG&E 2017f). Due to concerns of bank instability in the reservoir and the potential for sloughing material to block the outlet needle valve or be released downstream creating high turbidity and streambed sedimentation, the reservoir is operated to maintain a minimum reservoir storage of at least 10,000 ac-ft (12,000 ac-ft is used by PG&E as a planning minimum), resulting in a normal usable storage of 66,876 ac-ft. In 2023, PG&E discontinued closing the gates on Scott Dam in the spring due to seismic concerns. This reduced storage by approximately 20,000 ac-ft. Section 3.3.1 includes additional information on volume and surface area.

This section on Lake Pillsbury summarizes the existing physical habitat of the reservoir (reservoir operation, reservoir physical parameters, water temperature and dissolved oxygen, and aquatic habitat), the reservoir aquatic community (algae/zooplankton, aquatic molluscs, fish populations, amphibians, and reptiles), fish entrainment, and fish stocking.

Physical Environment

Aquatic Habitat

Aquatic habitat in Lake Pillsbury generally consists of areas of shallower shoreline and flats without vegetative cover and deeper open water areas (pelagic zone). Seasonal water level fluctuations in Lake Pillsbury generally preclude the development of large riparian vegetation or aquatic macrophyte (angiosperms) communities. There is a small amount of riparian/wetland vegetation at the tributary mouths and on the northern shore (Gravelly Valley) that is inundated at the highest reservoir elevations. Generally, the littoral zone (shallow photic zone where aquatic macrophytes could grow) provides little physical cover for aquatic species.

Thermal stratification during the spring, summer, and fall delineates the reservoir into a relatively large volume of warm water, epilimnetic habitat suitable for warm-water fishes (e.g., bass and sunfish), and a limited volume of colder metalimnion/hypolimnion habitat where cold-water fishes (e.g., rainbow trout) can live. The size of these habitats varies with the volume of storage, water temperature, and hypolimnetic oxygen concentration.

Reservoir Operation

PG&E stores winter/spring runoff in Lake Pillsbury and then releases that water throughout the year (particularly summer/fall) according to the RPA for various Project purposes and to maintain aquatic habitat in the Eel River. Lake Pillsbury is operated to fill each year (late spring/early summer), if possible, and stored water is used for downstream cold-water flow releases, diversions at the Van Arsdale Intake, and reservoir recreation. Historically, the reservoir fluctuated each year between “full” at about 60,000 to 77,000 ac-ft and “low storage” ranging from 10,000 to 40,000 ac-ft. Due to current reservoir level restrictions, the spillway gates at Scott Dam are kept open so that water cannot be impounded above the spillway elevation, thereby reducing water storage capacity in Lake Pillsbury by approximately 20,000 ac-ft.

Water is released from the reservoir through spill gates on top of the dam (radial and slide) and through the low-level outlet. The RPA governing minimum flow requirements includes consideration of inflows to Lake Pillsbury.

Reservoir Physical Parameters

Lake Pillsbury is relatively shallow. The northern and eastern arms of the reservoir (particularly the northern) include shallow bays that have large areas where the maximum depth is less than 25 ft. when the pool elevation is at the top of the spill gates. With the gates (40 ft.) not being used, some of the shallow areas are currently dewatered. Only a very small portion of the reservoir (immediately upstream of the dam) consists of deeper water. For additional information on Lake Pillsbury bathymetry, see Section 3.3.7.

Water Temperature and Dissolved Oxygen

Lake Pillsbury exhibits strong thermal stratification beginning late spring through early fall. The surface water (epilimnion) is warm, and the bottom water (hypolimnion) is relatively cold. By late summer/early fall, the hypolimnetic water is typically depleted due to the low-level releases into the Eel River and the warm surface water remains. Historical data indicate the surface water of Lake Pillsbury reaches about 24+°C by late June or early July (SEC 1998). The water temperature lower in the reservoir varies from approximately 13 to 15°C in the hypolimnion to approximately 20°C at the top of the metalimnion. For additional information on water temperatures in Lake Pillsbury, see Section 3.3.2.

The temperature of water released into the Eel River is affected by how low the reservoir volume is drawn down in late summer/early fall. The magnitude and duration of releases into the river ≥20°C is directly related to the remaining storage. Twenty degrees Celsius has commonly been used as an index temperature whereby conditions become stressful for rainbow trout, in part due to interspecies competition with Sacramento pikeminnow, although they can maintain positive growth at a temperature above 20°C depending on food availability and the diel temperature range (e.g., Hokanson et al. 1977; Myric and Cech 2001; Sullivan et al. 2000; Wurtsbaugh and Davis 1977a, 1977b). In some years, release temperatures have exceeded 22°C in late summer and early fall, when the hypolimnion was depleted and have exceeded 20°C for 30 to 50 days (PG&E 2006b–2016b).

Dissolved oxygen profiles, collected sporadically through the years (Ellison 1982), indicate concentrations remained near air saturation in the surface waters of Lake Pillsbury (typical of reservoirs), but gradually declined in the hypolimnion through the early summer, reaching depletion by late July (typical of eutrophic reservoirs).

Dissolved oxygen concentrations at the elevation of the intake to the Eel River discharge pipe are generally <4 mg/L in late summer (FERC 1978; Ellison 1982); however, aeration occurs as the water is released from the discharge structure (needle valve), which discharges the water in a jet spray into the Eel River and elevates the dissolved oxygen concentration (presumably to near saturation levels). For additional information on water quality in Lake Pillsbury, see Section 3.3.2.

Aquatic Community

Algae/Zooplankton

Because of the eutrophic nature of Lake Pillsbury, nutrients and algae concentrations (phytoplankton) are relatively high (USEPA 1978) and zooplankton numbers are also expected to be relatively high. Nutrients and chlorophyll-a concentrations are highest during September and October (PG&E 2019d). Sampling conducted in 2018 reports that thermal stratification and hypoxia occurred in Lake Pillsbury (PG&E 2019d).

Reports of increases in nuisance algae blooms (blue-green algae) and algal toxins (anatoxin-a) in the Eel River and Lake Pillsbury in 2014 and 2015 instigated sampling in 2016. Sampling conducted by PG&E found positive detections of anatoxin-a in Lake Pillsbury between late August and mid-October 2016. By late October, anatoxin-a was no longer detected at sites sampled in

Lake Pillsbury. PG&E did not detect cyanobacteria toxins (i.e., anatoxin-a) in 2018 in Lake Pillsbury (PG&E 2019d). A more detailed discussion of cyanobacterial toxins is provided in Section 3.3.2.

Aquatic Molluscs

Lake Pillsbury has been monitored for the invasive non-native Zebra mussel and Quagga mussel (*Dreissena polymorpha* and *D. rostriformis bugensis*) from 2009 to present (Lake County 2024; PG&E 2014g). When water levels allow, monitoring consists of examining shoreline surfaces where mussels might attach (e.g., docks, logs, concrete), placing artificial substrates away from shore, and collecting plankton samples. Surveys are conducted at the Lake Pillsbury Resort and Marina, the Fuller Grove Boat Ramp, and the Pillsbury Pines Boat Ramp, and six plankton tows (collected using a 63 micron [µm] net) are conducted annually when water levels allowed. Settling plates have been established at the log boom at Scott Dam and on a buoy at the Pillsbury Resort and Marina. To date, no adults, no mussel veligers, and no DNA markers for *Dreissena* larvae have been detected.

No special-status aquatic molluscs were detected in Lake Pillsbury during 2018 surveys (PG&E 2019b).

Fish Community

Fish species that are known to or that have the potential to occur in Lake Pillsbury are shown in Table 3.3.3-16. The primary sport fishery in Lake Pillsbury is for rainbow trout, largemouth bass, bluegill, and catfish (PG&E 2017g). Native rainbow trout inhabit the reservoir and tributaries. Hatchery rainbow trout are typically stocked annually in the reservoir. A large population of Sacramento pikeminnow exists in the reservoir (PG&E 2017g). Introduction of pikeminnow into the Eel River Watershed likely occurred because of a “bait bucket” introduction in Lake Pillsbury in the late 1970s (SEC 1998). Largemouth bass were stocked in Lake Pillsbury from Clear Lake in 1986 to potentially assist in controlling pikeminnow numbers (Baskerville-Bridges and Moyle 1989).

PG&E sampled the fish assemblage in Lake Pillsbury in September 2018 as part of Potter Valley Project relicensing. Sampling methods included boat electrofishing, gill netting, and minnow trapping in the main body of Lake Pillsbury and the Rice Fork and Eel River arms. In total, 1,010 fish were collected, representing six species, four of which were introduced (bluegill, Sacramento pikeminnow, largemouth bass, and golden shiner) and two of which were native (Sacramento sucker and western brook lamprey) (Figure 3.3.3-22). The catch was dominated by bluegill (54.6 percent) and largemouth bass (34.6 percent). A single adult western brook lamprey ammocoete was captured in Lake Pillsbury (PG&E 2019f).

Table 3.3.3-16. Fish species known to occur or that may[a] occur in Lake Pillsbury.

Family	Common Name	Scientific Name	Status
Salmonidae	Rainbow trout	*Oncorhynchus mykiss*	N[b,c]
Catostomidae	Sacramento sucker	*Catostomus occidentalis*	N[c]
Petromyzontidae	Western brook lamprey[d]	*Lampetra richardsoni*	N, SSC, FSS (MNF)
Cyprinidae	California roach	*Lavinia symmetricus*	I
	Sacramento pikeminnow	*Ptychocheilus grandis*	I[c]
	Golden shiner	*Notemigonus crysoleucas*	I
Centrarchidae	Largemouth bass	*Micropterus salmoides*	I
	Green sunfish	*Lepomis cyanellus*	I
	Bluegill	*Lepomis macrochirus*	I
Ictaluridae	Catfish	*Ictalurus* spp.	I[c]
	Brown bullhead	*Ameiurus nebulosus*	I
Clupeidae	Threadfin shad	*Dorosoma petenense*	I

[a] Potential species were identified from historical documents. The current species assemblage is not documented.
[b] Several non-native strains of rainbow trout have been planted in Project waters or waters that drain into the Project.
[c] Current presence based on CDFW (2016a).
[d] A single adult western brook lamprey ammocoete was captured in Lake Pillsbury during 2018 sampling (PG&E 2019f).

Notes: I = Introduced species
N = Native species

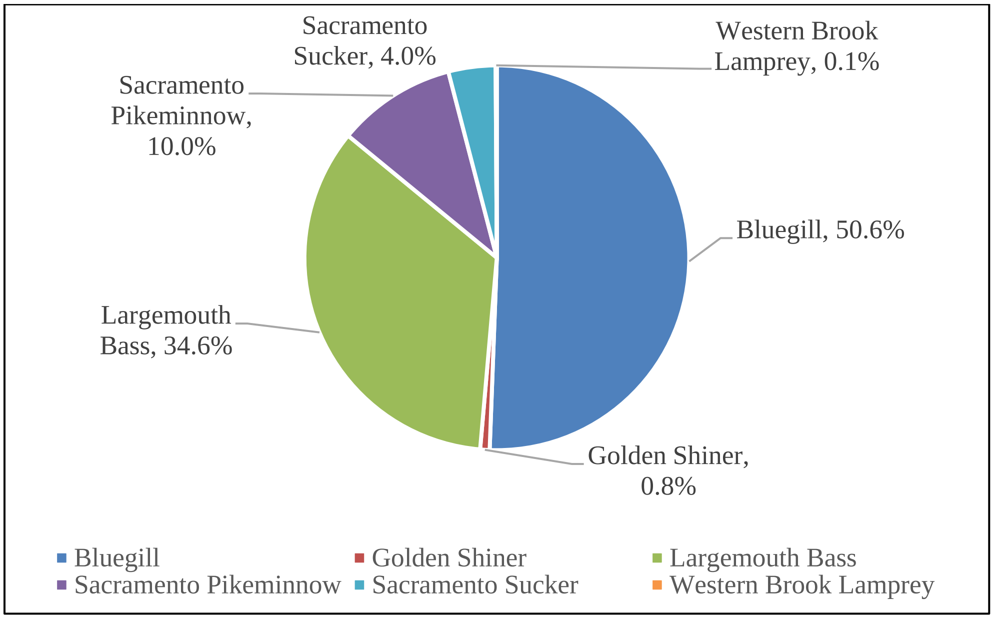


Figure 3.3.3-22. 2018 Fish Assemblage Data from Lake Pillsbury (PG&E 2019f).

Past tissue sampling results for fish from Lake Pillsbury showed high mercury concentrations, averaging 1.31 parts per million (ppm) in 350 millimeter (mm) largemouth bass, and the highest concentration for an individual fish (4.08 ppm in a 559 mm largemouth bass) in statewide sampling (Davis et al. 2009). Low concentrations of mercury and methylmercury were detected in Lake Pillsbury sportfish tissue samples in a 2018 study, generally greater than 0.2 milligram per kilogram (mg/kg) wet weight. Detected concentrations ranged from 0.25 mg/kg wet weight in bluegill to 2.08 mg/kg wet weight in Sacramento pikeminnow. Detected concentrations were highest during October in the bottom water at Lake Pillsbury near Scott Dam and in the Eel River Arm of Lake Pillsbury (PG&E 2019d). Consequently, Lake Pillsbury is designated as impaired for mercury on the California 303(d) list (Section 3.3.2).

Amphibians and Reptiles

Amphibians and aquatic reptiles may use the margins of Lake Pillsbury where there is suitable habitat (e.g., sufficient vegetative cover and shallow water). Northwestern pond turtle were documented in the reservoir during visual encounter surveys conducted in 2018, primarily along southern margins, in coves, and in tributary arms of the Eel River and the Rice Fork (PG&E 2019a; Map 3.3.3-7 and Table 3.3.3-15). Size class distribution (presence of adults and juveniles) suggested breeding occurs (PGE 2019a).

Foothill yellow-legged frogs likely do not occur in Lake Pillsbury because of its preference for lotic habitats, but the species was observed in the Eel River and Rice Fork upstream of the reservoir influence during 2018 surveys (PG&E 2019a; Map 3.3.3-7 and Table 3.3.3-15). Some larvae may drift from these tributaries into the reservoir, but the reservoir would not be considered sustainable habitat due to the presence of predatory species and lentic habitat.

Based on the California Freshwater Species Database (Howard et al. 2015b) and species distributions (AmphibiaWeb 2024), additional native lentic breeding taxa that could mate and oviposit in the reservoir include western toad, Sierran treefrog, California newt, and rough-skinned newt. Garter snakes that forage on amphibians and fish may use habitat along the margins of Lake Pillsbury. None of these species has special status. See Table 3.3.3-14 for more information on these species.

Garter snakes that forage on amphibians and fish may use habitat along the margins of Lake Pillsbury. Non-native bullfrogs, which are predators and competitors to native biota, were also observed in Lake Pillsbury during 2018 surveys (PG&E 2019a).

Fish Entrainment

The potential for entrainment of aquatic species into the low-level outflow needle valve of Scott Dam has not been quantified. During the summer when hypolimnion oxygen depression exists, it is anticipated that fishes would not be present near the low-level outlet and thus not subject to entrainment. During other time periods, it is anticipated that densities of fishes at the bottom of the reservoir near the outlet would be very low, like other reservoirs (Placer County Water Agency 2011; Nevada Irrigation District and PG&E 2011); thus, the potential for entrainment is low.

Fish Stocking

Rainbow trout are typically stocked each year in Lake Pillsbury. Fish stocking data including total number of stocked fish and total pounds of stocked fish from 2002 to 2024 are provided in Table 3.3.3-17.

Table 3.3.3-17. Catchable rainbow trout planted in Lake Pillsbury by the California Department of Fish and Wildlife.

Year	Number	Pounds
2002	14,035	7,650
2003	10,770	6,300
2004	3,600	2,000
2005	5,400	3,000
2006	7,400	4,000
2007	5,100	3,000
2008	5,500	3,000
2009	11,900	6,000
2010	0	0
2011	5,800	3,000
2012	5,600	3,000
2013	5,800	3,000
2014	5,100	2,500
2015	3,230	1,900
2016	3,000	1,500
2017	2,100	1,000
2018	2,000	2,000
2019	1,600	2,000
2020	0	0
2021	1,957	2,000
2022	0	0
2023	60	300
2024	1,000	1,000

Source: Personal communication, Allan Renger, CDFW, with Craig Addley, Kleinschmidt Group, 2024

3.3.3.7 Van Arsdale Reservoir

Cape Horn Dam is approximately 60 ft. high and impounds the Eel River to create Van Arsdale Reservoir. It was constructed in 1908 to serve as the Project's diversion site (Figure 3.3.3-1) and creates the forebay for the Van Arsdale Intake, providing the head necessary for current Project operations. The current storage capacity of Van Arsdale Reservoir is less than 390 ac-ft. Cape Horn Dam is equipped with a fish ladder, which was last modified in 1987 to improve passage of salmon and steelhead. The Van Arsdale Intake is equipped with fish screens and a fish bypass channel. The original fish screen, a horizontal traveling screen, was constructed in 1972 and replaced with a pair of inclined plane screens in 1995 (ERF 2016).

This section on Van Arsdale Reservoir summarizes the physical habitat of the reservoir (reservoir operation, reservoir physical parameters, water temperature and dissolved oxygen, and aquatic habitat), the reservoir aquatic community (algae/zooplankton, aquatic molluscs, fish populations, amphibians, and reptiles), fish entrainment, and fish stocking.

Physical Environment

Aquatic Habitat

Aquatic habitat in Van Arsdale Reservoir is generally riverine in nature. The reservoir is somewhat wider and slower than the Eel River upstream or downstream, but the small size and shallow nature of the reservoir results in water velocities typical of riverine habitat. Backwater habitat exists in several cutoff, side channels along the length of the reservoir, and a deeper slow-water pool area exists near the dam and the fish screen. Riparian vegetation typical of the Eel River (alder and willow) exists along the reservoir, but because of the broader alluvial floodplain, the band of vegetation is wider and more continuous in the vicinity of the reservoir than typically exists along the river (see Section 3.3.4). Fine sediment deposition in the reservoir and slower velocities make most of the reservoir unsuitable for anadromous salmonid spawning. Section 3.3.7 provides additional information on currently assessed sedimentation in Van Arsdale Reservoir.

Reservoir Operations

Van Arsdale Reservoir is currently operated as a run-of-river reservoir with a gross storage capacity of 390 ac-ft at an elevation of 1,494 ft. The reservoir is generally used as a regulating reservoir for the diversion intake. Fluctuations in reservoir elevation occur because of different flow levels in the Eel River, but not as a function of reservoir storage operations. The reservoir provides the elevation head required to divert water through the Van Arsdale Intake. The un-diverted water passes downstream in the Eel River over the full crest of the dam, through the low-flow release structure at the center of the dam, through the fish ladder on river left, or through the fish bypass channel of the fish screening system that empties into the fish ladder. At low river flows, controlled releases are made through the low-flow release structure and the fish ladder. At higher flows, the undiverted water also passes over the crest of the dam (Figure 3.3.3-2).

Water Temperature and Dissolved Oxygen

Due to the run-of-the-river nature of Van Arsdale Reservoir, its temperature regime is like that of the Eel River's. Temperatures here are influenced by the temperature of releases made 12 mi. upstream from Scott Dam and the natural warming or cooling that occurs along the length of river, depending on the season of the year. Because of Van Arsdale Reservoir's small volume and rapid turnover time, dissolved oxygen concentrations are likely near saturation due to upstream mixing and reservoir water surface oxygen transfer processes.

Aquatic Community

Limited fisheries data exist for the Van Arsdale Reservoir and Cape Horn Dam area. Due to the riverine nature of Van Arsdale Reservoir, the aquatic community in the reservoir is likely typical of the mainstem Eel River. No fish stocking occurs in Van Arsdale Reservoir. PG&E completed snorkeling surveys in July 2018 in four survey reaches within Van Arsdale Reservoir and downstream of Cape Horn Dam as part of Potter Valley Project relicensing (PG&E 2019f). The survey reaches were dominated by non-native Sacramento pikeminnow, which accounted for 92 percent of the observations. Other species, including California roach, Sacramento sucker, bluegill, largemouth bass, and *O. mykiss*, were observed less frequently (i.e., 0.8 to 3.6 percent of the observed fish). Researchers identified 18 "hot-spots" throughout the survey areas, which were defined as areas containing five or more predatory-sized fish (PG&E 2019f).

Non-native pikeminnow have been implicated in the displacement and predation of anadromous salmonids in the Eel River and in the vicinity of Van Arsdale Reservoir in particular. The RPA required PG&E to implement pikeminnow abundance monitoring and a population suppression program in the Project vicinity. In 2006, PG&E began implementing pikeminnow suppression efforts using gillnets upstream and downstream of Cape Horn Dam, but this approach was halted due to potential effects on juvenile steelhead. In 2019, PG&E reinitiated pikeminnow suppression efforts in Van Arsdale Reservoir. Since 2020, PG&E has conducted pikeminnow suppression using boat electrofishing in Van Arsdale Reservoir as specified by the Pikeminnow Adaptive Management and Suppression Operation Plans developed in collaboration with NMFS, CDFW, and the Round Valley Indian Tribes.

Foothill yellow-legged frog is not expected to occur in Van Arsdale Reservoir because of its preference for lotic habitats, but this species was documented in the mainstem Eel River just above the reservoir during 2018 surveys (PG&E 2019a). Some larvae may drift from Eel River tributaries above Cape Horn Dam into the reservoir, but the reservoir would not be considered suitable habitat.

Based on the California Freshwater Species Database (Howard et al. 2015b) and species distributions (AmphibiaWeb 2024), other native amphibians that could mate and oviposit in this lentic environment include western toad, Sierran treefrog, California newt, and rough-skinned newt. None of these species has special status. See Table 3.3.3-14 for more information on these species.

Northwestern pond turtle is present in Van Arsdale Reservoir , and this species was also observed just upstream during 2018 amphibian and reptile surveys (PG&E 2019a). Garter snakes that forage on amphibians and fish may use habitat along the margins of the reservoir.

Non-native bullfrogs were observed in the mainstem Eel River below Scott Dam during 2018 surveys and are present in Van Arsdale Reservoir (PGE 2019a).

Fish Entrainment

Concern regarding entrainment of salmonids to the Potter Valley Powerhouse resulted in installation of a horizontal traveling screen in 1972 (operation began in March) at the Van Arsdale Intake. Because it was only the sixth prototype of a design concept developed by the Bureau of Commercial Fisheries (predecessor agency to NMFS), CDFG agreed to co-fund operation and maintenance. The design did not prove well adapted to the heavy sediment and organic debris loads carried by the Eel River and suffered frequent breakdowns. In the 1982 Settlement Agreement reached during relicensing, CDFG recognized its responsibility under the Fish and Game Code for modifying the fish screen and agreed to seek funding to correct the deficiencies in the screen. In March 1983, after being notified that the fish screen needed further repair, CDFG concluded that "...considering all things, including economics, it would be unwise to repair the existing screen this spring" (Hunter 1983). They also concluded, "The best course of action appears to be the replacement of the screen as soon as possible as provided in our pending Potter Valley Project relicensing agreement." While working on the development of an acceptable design, two interim approaches were used to minimize entrainment of downstream migrating salmon and steelhead. In April and May of 1985 and 1986, a combination of powerhouse curtailment (i.e., no releases through the diversion to the powerhouse) and release of pulses of CDFG block water were used to move fish past the diversion during the expected peak of downstream migration. In all other spring seasons between 1987 and 1995, a river-wide array of downstream migrant traps identified as the "Fish Rescue" were deployed upstream of Van Arsdale Reservoir when flows permitted (generally less than 500 cfs). Juvenile salmonids collected using this trap array were then transported around Cape Horn Dam and released downstream.

Potential equivalent adult losses from entrainment of juveniles from 1979 to 1993 were quantified by SEC (1998). It was estimated that in 1 year (1984/1985), an equivalent of up to approximately 9 percent of the adult steelhead population was lost due to juvenile entrainment but in other years the equivalent adult loss was lower. The available data suggested that entrainment was not a significant factor affecting Chinook returns in any year monitored.

CDFG was unable to secure sufficient funding for replacement of the screen. PG&E took on responsibility for screen replacement and began constructing new fish screens at the Van Arsdale Intake in late 1994. The new screens were completed in December 1995. The existing fish screening system consists of two fish screen bays, two inclined plane screens, an Archimedes screw pump, and a fish return channel, all located at the entrance to the diversion tunnel. The fish return channel leads to a secondary fish screen that reduces the fish return flow from 4 cfs to 2 cfs. This reduced flow carries screened fish through a series of fish return pipes to a half-round ogee spillway and a baffled flume, where it discharges into the fish ladder just upstream of VAFS.

With these fish screens in place, entrainment has not been a factor for the Eel River fishery. During the maintenance window for the screen in August and September, it is possible for unscreened diversions to occur. However, unscreened diversions are minimized by conducting maintenance on one screen at a time and diverting water through the other screen, when possible. Also, historical entrainment sampling has shown August and September as the time period when there is a low risk of entrainment. Currently, the protocol is for PG&E to sample for entrainment 1 day per week during the period when unscreened diversions occur (PG&E 2016g).

When PG&E conducts annual maintenance at the Van Arsdale facilities, the fish screen bays and fish return channel are dewatered to allow for inspection. Immediately following dewatering, PG&E conducts a fish rescue to remove fish from residual water that remains in the fish screen bays. PG&E or CDFW also conducts fish rescues in the fish screen return channel and fish ladder during the scheduled maintenance period. Pikeminnow and other non-native fish species captured during these efforts are euthanized, while native fish species are transported and released in Van Arsdale Reservoir or the Eel River downstream of Cape Horn Dam. Once dewatering and fish rescues are complete, PG&E inspects the fish return system and conducts any necessary maintenance and repairs.

In more recent years, fish ladder closures at Cape Horn Dam have occurred when high-flow events occur, per PG&E's winter storm procedure (PG&E 2020e). During high-flow events, when river levels exceed 7,000 cfs, the fish screen and diversion are shut down to prevent damage to facilities. Similarly, PG&E has adopted CDFW's protocol requiring the fish ladder to shut down as the river approaches 6,000 cfs to prevent debris and sediment from plugging the ladder. The fish ladder closures typically occurred January through April but do not occur on an annual basis. No fish ladder closures at Cape Horn Dam occurred in water years 2020, 2021, or 2022 due to high-flow events, and future fish ladder closures are expected to be minimized by the installation of the fish hotel sediment exclusion doors in 2020.

3.3.3.8 East Branch Russian River

Physical Environment

Physical and hydrological conditions in the East Branch Russian River were minimally affected after the completion of the Potter Valley Tunnel in 1908. From 1908 to 1922, augmented flows were derived from the natural flow of the Eel River, which was subject to seasonal fluctuations, with low summer flows like the pattern in the Russian River. After the completion of Scott Dam in 1922, water storage capability in Lake Pillsbury ensured sustained high summer flows in the East Branch Russian River, supporting prolific steelhead populations (Beak Consultants and Prolysts, Inc. 1984).

The construction of Coyote Dam (forming Lake Mendocino) in 1959 eliminated anadromous salmonid runs in the East Branch Russian River. Since then, the river has functioned as habitat for an active recreational rainbow trout fishery supported by CDFW hatchery plants. A search of the California Passage Assessment Database, which is maintained by CalFish, indicated no fish passage barriers within the East Branch Russian River upstream of Coyote Dam.

Under RPA flows, minimum flow requirements in the East Branch Russian River range from 5 to 75 cfs between May 15 and September 15 and from 5 to 35 cfs between September 16 and May 14 depending on water year classification (ERF 2016). With the recent flow variances requested by PG&E on the Project and pending amendment related to inadequate water supply at Lake

Pillsbury, minimum flows in recent years have generally been lower in the East Branch Russian River. Proposed amendment flows are as follows:

- October 1 to April 14 depends on water year classification only (RPA flows):
  - Normal and dry: 35 cfs
  - Critical: 5 cfs
- April 15 to June 30 depends on water year classification and spill condition:
  - When Lake Pillsbury is above 1,900.0 ft. (spilling; RPA flows):
    - Normal: 35 cfs through May 14 and 75 cfs May 15 through June 30
    - Dry: 25 cfs
    - Critical: 5 cfs
  - When Lake Pillsbury is at or below 1,900.0 ft. (not spilling):
    - 5 cfs
- July 1 to September 30:
  - 5 cfs

In addition, PG&E has contractual deliveries to the Potter Valley Irrigation District (PVID), and water is transported either through the East Branch Russian River or via canals. Under the RPA, PG&E deliveries to PVID canals are no more than 5 cfs from October 15 to April 15. After April 15, PG&E deliveries are no more than 50 cfs. From March 15 to April 15, PVID can request frost protection water up to 50 cfs. In recent years, deliveries to PVID canals have been demand-based due to inadequate water supply in Lake Pillsbury.

The entire Russian River Watershed is listed under Section 303(d) of the Clean Water Act as impaired for sediment and temperature (USEPA 2024).

Refer to Section 3.3.1 for additional information on water use and hydrology in the study area.

Aquatic Habitat

In general, the East Branch Russian River is low gradient, dropping 23 ft. per mile over the 11 mi. from the Potter Valley Powerhouse to the ordinary high-water mark of Lake Mendocino. From the powerhouse, the river runs through the agriculture lands of the Potter Valley before entering an open canyon area above Lake Mendocino. Through Potter Valley, the riparian corridor along the riverbank is approximately 100 to 200 ft. wide. Downstream of Potter Valley to Lake Mendocino, riparian vegetation is likely a mix of Fremont cottonwood (*Populus fremontii*), willows (*Salix* spp.), and white alder (*Alnus rhombifolia*) (Sonoma Water 2016). Section 3.3.7 and Section 3.3.2 provide more information on these components of aquatic habitat in the East Branch Russian River.

As part of relicensing studies in 2018, PG&E completed aquatic habitat mapping in two reaches of the East Branch Russian River (PG&E 2019f). Methods followed standard habitat mapping and classification procedures in the State of California.[7] Data on the abundance and distribution of spawning gravel and large woody debris were also collected. Two representative reaches were surveyed: one site in the lower-gradient "valley reach" (approximately 2.2 RM downstream of the Potter Valley Powerhouse) and one site in the higher-gradient "canyon reach" (approximately 2 RM upstream of the Lake Mendocino high water mark). Habitat data demonstrated that under baseline conditions, the canyon reach was dominated by runs (51 percent), pools (25 percent), and riffle habitat (17 percent) and the valley reach was dominated by riffle (40 percent), pool (33 percent), and run habitat (20 percent) (Figure 3.3.3-23 and Figure 3.3.3-24). A limited amount of suitable spawning gravel for salmonids (~3,000 square feet, i.e., less than 0.1 acre) and 20 pieces of large woody debris were observed in both reaches combined (PG&E 2019f).

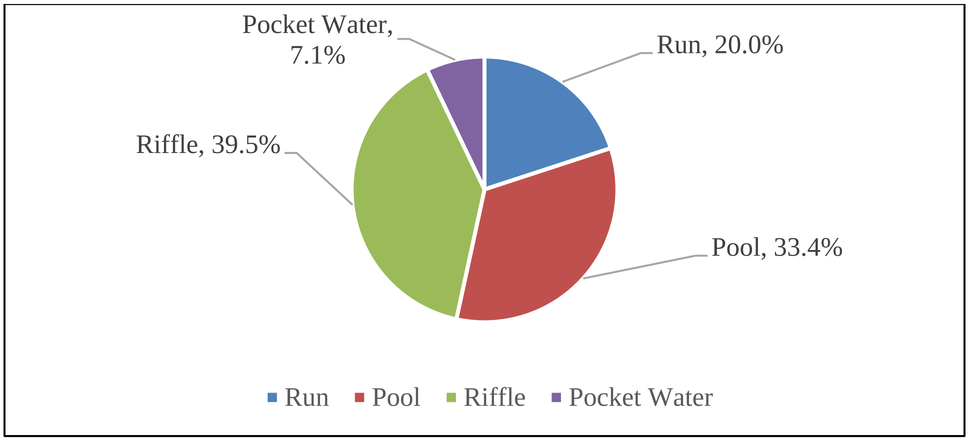


Figure 3.3.3-23. Summary of Riverine Habitat Mapping, East Branch Russian River – Valley Reach (2018)

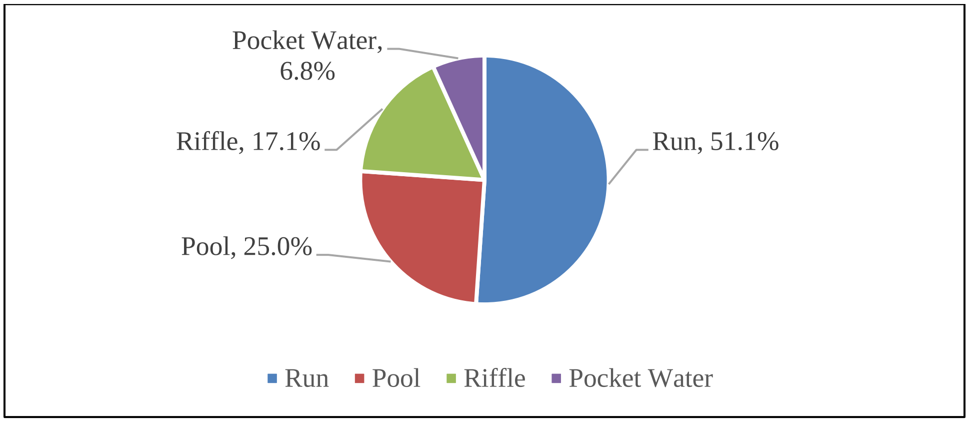


Figure 3.3.3-24. Summary of Riverine Habitat Mapping, East Branch Russian River – Canyon Reach (2018)

7 CDFW's California Salmonid Stream Habitat Restoration Manual.

Aquatic Community

Benthic Macroinvertebrates

CDFW's Aquatic Bioassessment Lab has collected BMI samples from two sites on the East Branch Russian River: one in 2004 and one in 2006 (SWRCB 2016) (Table 3.3.3-18).

Table 3.3.3-18. Benthic macroinvertebrate sample sites on the East Branch Russian River.

Stream Name (Site Code)	Location Description	Coordinates (latitude/longitude)	Sampling Date	Data Source
East Fork Russian River (EFRR-1)	0.7 mi. above the confluence with Cold Creek	39.2514/-123.118	9/21/2004	SWRCB 2016
East Fork Russian River (EFRR-2)	1.8 mi. above the confluence with Cold Creek	39.2608/-123.111	8/22/2006	SWRCB 2016

BMI data from these sites are summarized in Table 3.3.3-19 and include taxonomic identification of subsampled BMI and biological metrics for each sample.

Table 3.3.3-19. Biological metrics for benthic macroinvertebrate samples collected in the East Branch Russian River.

Metrics	EFRR-1	EFRR-2
Richness		
Taxonomic	30	25
EPT[a]	14	13
ET	12	13
Coleoptera	4	2
Shredder	0	1
Diversity		
Shannon Diversity Index	2.3	2.5
Non-Insect Taxa (%)	24	36
Coleoptera Taxa (%)	12	6
EPT Taxa (%)	47	52
Tolerance		
Intolerant Taxa (%)	21	24
Tolerant Taxa (%)	12	18
Distribution		
Scrapers (%)	15	16
Predators (%)	5	9

[a] Ephemeroptera, Plecoptera, Trichoptera

The 2006 BMI sample from site EFRR-2 was collected as part of a perennial streams assessment conducted by the Surface Water Ambient Monitoring Program (SWRCB 2015). The objective was to describe the biological conditions of streams in the state of California using the California Stream Condition Index (CSCI). The CSCI is based on a large, state-wide BMI dataset and integrates two measures for evaluating sites: BMI taxonomic completeness, which uses an observed-to-expected ratio, and a multi-metric index (Rehn et al. 2015). CSCI scores typically range from 0.1 (great departure from reference condition) to 1.4 (exceeding quality of reference condition) and are divided into four interpretive categories of biological condition: ≥0.92 = likely intact (good) condition; 0.91 to 0.80 = possibly altered (fair) condition; 0.79 to 0.63 = likely altered (poor) condition; ≤0.62 = very likely altered (very poor) condition (Rehn et al. 2015). The CSCI score for the sample collected from site EFFR-2 as part of the perennial streams assessment was 0.71 and fell within the "likely altered condition" category of the index (SWRCB 2016).

Aquatic Molluscs

The reach of the East Branch Russian River affected by current Project operations is within the historical range of the western pearlshell mussel, California floater, and western ridged mussel (*Gonidea angulata*) (Howard et al. 2015a). The western ridged mussel and California floater have been observed in recent surveys farther downstream in the Russian River Watershed (Howard et al. 2015a). Western pearlshell mussels were observed during focused 2018 surveys in the East Branch Russian River (PG&E 2019b). They were found at the two downstream-most sites in the East Branch Russian River (EB_ABLM and EB_MC).

The invasive gastropod *Potamopyrgus antipodarum* (New Zealand mudsnail) has been documented farther downstream in the Russian River below Lake Mendocino near Ukiah and Hopland, according to USGS's Non-Indigenous Aquatic Species Database (USGS 2024). No invasive mussels have been documented in the East Branch Russian River in the study area. Unidentified freshwater mussel were also observed in the mainstem East Branch Russian River during 2018 surveys (PG&E 2019f).

Fish Community

The construction of Coyote Dam in 1959 eliminated anadromous salmonid and Pacific lamprey runs in the East Branch Russian River. Since then, the East Branch Russian River, with summer stream flows augmented by releases from the Project, has functioned as habitat for a recreational trout fishery supported by CDFW hatchery plants. Other than fish stocking records (refer to Table 3.3.3-20), little information is available on fish species inhabiting the East Branch Russian River. PG&E sampled the fish assemblage in the East Branch Russian River as part of the relicensing surveys in September 2018 (PG&E 2019f). Surveys were conducted in two locations, one in the upper reach of the East Branch Russian River where the river channel is low-gradient and a second in the lower reach where the channel is higher-gradient. Fish identified during the study included rainbow trout, Sacramento pikeminnow, California roach, smallmouth bass, Sacramento sucker, and unidentified minnow species (Table 3.3.3-20) (PG&E 2019f). California roach and Sacramento sucker were also documented in a historical fish survey of Mewhinney Creek, a tributary to the East Branch Russian River (CDFG 1959). Sacramento pikeminnow, California roach, and Sacramento sucker may have been entrained at the Van Arsdale Intake prior to installation of the current fish screens. There is genetic evidence that lampreys originating in the Eel River have ended up in the East Branch Russian River. Western brook lamprey collected in the East Branch Russian River were nearly genetically identical to those in the Eel River (whereas *Lampetra* ammocoetes collected elsewhere in the Russian River Basin are likely a similar but separate species known as Pacific brook lamprey [*Lampetra c.f. pacifica*]) (Sonoma Water 2016).

Table 3.3.3-20. East Branch Russian River 2018 Fish Population Study Results

Reach	Rainbow Trout	Sacramento Pikeminnow	California Roach	Smallmouth Bass	Sacramento Sucker	Unknown Cyprinid
Lower Reach	13	150	0	8	6	2
Upper Reach	29	50	18	0	4	564

Source: PG&E 2019f

A variety of native and introduced warm-water fish species are present in Lake Mendocino, and some individuals presumably enter the lower portions of East Branch Russian River above the reservoir. These species include largemouth bass, smallmouth bass (*Micropterus dolomieu*), striped bass (*Morone saxatilis*), black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis annularis*), bluegill, redear sunfish (*Lepomis microlophus*), white catfish (*Ameiurus catus*), channel catfish (*Ictalurus punctatus*), yellow bullhead (*Ameiurus natalis*), tule perch (*Hysterocarpus traski*), Sacramento pikeminnow, and common carp (*Cyprinus carpio*) (U.S. Army Corps of Engineers [USACE] 2016). Non-native crayfish were also observed in the mainstem East Branch Russian River during 2018 surveys (PG&E 2019f).

Amphibians and Reptiles

Table 3.3.3-14 lists common and special-status amphibian and aquatic reptile species that are known to, or have the potential to, occur in the East Branch Russian River, including their regulatory status, habitat associations, and potential distribution. The California Freshwater Species Database (Howard et al. 2015b) and AmphibiaWeb (2024) were used in the data search. For species with special status, including foothill yellow-legged frog and northwestern pond turtle, the RareFind database of CDFW was used directly along with results of targeted field surveys in 2018 (CDFW 2024a; PG&E 2019a).

Foothill yellow-legged frog and northwestern pond turtle currently inhabit the mainstem East Branch Russian River. Foothill yellow-legged frog was determined to be present in the mainstem and at slightly higher densities in tributaries such as Mewhinney Creek during 2018 surveys (PG&E 2019a). Multiple life stages (tadpoles, metamorphosed young-of-year, and adults) were observed in the above Lake Mendocino, and egg masses and multiple life stages were observed in the East Branch Russian River near Mewhinney Creek.

Northwestern pond turtles were documented in a farm pond in Potter Valley and in the East Branch Russian River near the confluence with Cold Creek in 2004. Northwestern pond turtles were also found in the East Branch Russian River and in Busch and Mewhinney Creeks during 2018 surveys

(PG&E 2019a). Adults were observed, and breeding (nesting) habitat was determined to be present. Northwestern pond turtle and foothill yellow-legged frog occurrences in the East Branch Russian River and tributaries are shown in Map 3.3.3-7, and presence by reach is provided in Table 3.3.3-15.

Based on the California Freshwater Species Database (Howard et al. 2015b) and species distributions (AmphibiaWeb 2024), additional native lentic breeding taxa that could mate and oviposit here include western toad, Sierran treefrog, California newt, and rough-skinned newt. Garter snakes that forage on amphibians and fish may use habitat along the margins of the river. None of these species has special status. See Table 3.3.3-14 for more information on these species.

Non-native bullfrogs were also observed in the mainstem East Branch Russian River during 2018 surveys (PG&E 2019a).

Fish Stocking

From the 1970s to the early 1980s, 28,000 to 30,000 (3-to-4 per pound) rainbow trout were planted annually by CDFW to support recreational fishing in the East Branch Russian River above Lake Mendocino (PG&E 2017g). From the early 1980s through the mid-1990s, 20,000 rainbow trout (2–3 per pound) and 25,000 brown trout fingerlings were planted annually. CDFW continues to stock "catchable" (~12-in. length) hatchery rainbow trout in the reach above Lake Mendocino annually from July through October (CDFW 2024b). Table 3.3.3-21 shows stocking records from 2001 to present. Additionally, in 2012, CDFW began to stock sterile triploid rainbow trout in Lake Mendocino in the winter; these fish may enter the East Branch Russian River upstream of the reservoir (PG&E 2017g).

Table 3.3.3-21. Catchable rainbow trout planted in East Branch Russian River by CDFW.

Year	Number	Pounds
2001	7,400	4,300
2002	15,075	8,250
2003	38,800	8,165
2004	33,185	4,000
2005	39,650	7,985
2006	16,490	8,800
2007	7,930	4,950
2008	10,620	6,700
2009	11,285	5,990
2010	12,125	6,500
2011	10,630	6,000
2012	25,000	12,000
2013	23,230	11,900
2014	21,300	12,000

Year	Number	Pounds
2015	9,165	5,000
2016	8,573	5,000
2017	2,100	1,000
2018	2,000	2,000
2019	1,600	2,000
2020	0	0
2021	1,957	2,000
2022	0	0
2023	60	300
2024	1,000	1,000

Source: Personal communication, Allan Renger, CDFW, with Craig Addley, Kleinschmidt Group, 2024

3.3.3.9 Critical Habitat

Critical habitat is habitat needed to support the recovery of listed species. Critical habitat designation requires consultation with National Oceanic and Atmospheric Administration (NOAA) Fisheries to ensure actions undertaken by a federal agency are not likely to adversely modify or destroy the critical habitat designated (NOAA 2024).

The Eel River downstream of Lake Pillsbury, including the large tributaries in the Project area, Tomki Creek and Outlet Creek, are designated as critical habitat for Northern California Coastal DPS steelhead and California Coastal ESU Chinook salmon (Federal Register [FR] September 2, 2005 [70 FR 52488–52627] [Office of the Federal Register 2005]). As of 2024, the Eel River Watershed has not been designated as critical habitat for coho salmon. The Eel River estuary overlaps with designated critical habitat for the tidewater goby, which is federally listed as endangered (FR, February 6, 2013 [78 FR 8746 – 8819]) (USFWS 2013).

3.3.3.10 Essential Fish Habitat

Congress recognized the importance and directed the management of essential fish habitat (EFH) via the Magnuson-Stevens Fishery Conservation and Management Act of 1976. They established procedures to identify, conserve, and enhance EFH for the protection and sustainability of both the biology and economics of commercial and recreational fisheries. As a result, agencies that propose federal actions that may affect EFH are required to request consultation from NOAA Fisheries to analyze the effects on EFH. Definitions of EFH are specific to each of the fishery management plans (FMPs) and are included within each as a narrative. There are five FMPs on the Pacific Coast—Fishery Ecosystem Plan (FEP), Coastal Pelagic Species Management Plan (CPS), Pacific Coast Groundfish Fishery Species Management Plan (PCG), West Coast Highly Migratory Species Fishery Management Plan (HMS), and Pacific Coast Salmon Fisheries Management Plan (PCS) (Table 3.3.3-22) (PFMC 2024a, 2024b, 2024c, 2023, and 2022). Designated EFH identifies waters and substrates required by these commercially managed fish for spawning, breeding, feeding, and growth to maturity. Pacific Fisheries Management Council (PFMC) and NOAA Fisheries govern the FMPs and are tasked with their management (Section 3.3.18 for more information).

FMPs with EFH in the Eel River include:

- CPS upstream past Fernbridge to the confluence with the Van Duzen River;
- PCG upstream past Fernbridge to Stafford (RM 25); and
- PCS from the estuary and upstream to below Scott Dam.

HMS and FEP have no EFH within the estuary or the upstream Eel River.

3.3.3.11 Special-Status Species

Aquatic special-status species are defined here as species granted status by federal and state agencies. Federally listed species with special status under the ESA include those federally designated as threatened, endangered, or proposed for listing. State-listed aquatic species, which are granted special status by CDFW under the CESA, include threatened, endangered, and California fully protected species, and SSC. USFS maintains lists of FSS species for each forest in Region 5 (USFS 2013). FSS species are those species identified by a regional forester as having current or predicted downward trends in population numbers or density, or current or predicted downward trends in habitat quality that would reduce the species' current distribution. FSS identified as sensitive in the MNF are identified below. Refer to Table 3.3.3-3 and Table 3.3.3-15 for summaries of special-status species with potential occurrence in the study area.

Steelhead

Steelhead (both winter-run and summer-run) in the Eel River are considered part of the Northern California Coast DPS, and the species is listed as threatened under the ESA and as endangered under the CESA (NMFS 2016a). This DPS is also listed as a CDFW SSC (CNDDB 2024). The Northern California DPS summer steelhead is also listed as endangered under the CESA. Steelhead in the upper Eel River are considered part of the Lower Interior Diversity Stratum, which includes populations spawning in tributaries between Dos Rios and Scott Dam. Upstream of Scott Dam, steelhead are part of the North Mountain Interior Diversity Stratum, which includes the upper mainstem Eel River population (NMFS 2016a). This species is confirmed to be found throughout the Project vicinity downstream of Scott Dam (see Table 3.3.3-3).

Table 3.3.3-22. Designated essential fish habitat for fishery management plans in the Eel River and/or the estuary including marine life stages in the Pacific Ocean.

Family	Common Name	Scientific Name	EFH		Designated EFH by Reach	
			FMP	Upper Eel River Below Scott Dam	Lower Eel River*	Eel River Estuary
Salmonidae	Chinook	*Oncorhynchus tshawytscha*	PCS	X	X	X
	Coho salmon	*O. kisutch*	PCS	X	X	X
Squalidae	Pacific spiny dogfish	*Squalus suckleyi*	PCG	–	X	X
Hexagrammids	Lingcod north	*Ophiodon elongatus*	PCG	–	X	X
	Lingcod south	*Ophiodon elongatus*	PCG	–	X	X
Anoplopomatidae	Sablefish	*Anoplopoma fimbria*	PCG	–	X	X
Scorpaenidae	Black rockfish - Washington	*Sebastes melanops*	PCG	–	X	X
	Black rockfish - California	*S. melanops*	PCG	–	X	X
	Canary rockfish	*S. pinniger*	PCG	–	X	X
	Copper rockfish north	*S. caurinus*	PCG	–	X	X
	Copper rockfish south	*S. caurinus*	PCG	–	X	X
	Quillback rockfish -Washington	*S. maliger*	PCG	–	X	X
	Quillback rockfish - Oregon	*S. maliger*	PCG	–	X	X
	Quillback rockfish - California	*S. maliger*	PCG	–	X	X
	Squarespot rockfish	*S. hopkinsi*	PCG	–	X	X
	Vermilion rockfish	*S. miniatus*	PCG	–	X	X
	Sunset rockfish	*S. crocotulus*	PCG	–	X	X
	Shortspine thornyhead	*Sebastolobus alascanus*	PCG	–	X	X

Family	Common Name	Scientific Name	EFH		Designated EFH by Reach	
			FMP	Upper Eel River Below Scott Dam	Lower Eel River*	Eel River Estuary
Pleuronectidae	Dover sole	*Microstomus pacificus*	PCG	–	X	X
	Petrale sole	*Eopsetta jordani*	PCG	–	X	X
	Petrale sole	*E. jordani*	PCG	–	X	X
	Rex sole	*Glyptocephalus zachirus*	PCG	–	X	X
Alosidae	Pacific sardine	*Sardinops sagax*	CPS	–	X	X
Scombridae	Pacific (chub) mackerel	*Scomber japonicus*	CPS	–	X	X
Engraulidae	Northern anchovy – central and northern subpopulations	*Engraulis mordax*	CPS	–	X	X
Loliginidae	Market squid	*Doryteuthis opalescens*	CPS	–	X	X
Carangidae	Jack mackerel	*Trachurus symmetricus*	CPS	–	X	X
Euphausiidae	Krill/euphusiids	*Euphausia pacifica*	CPS	–	X	X
		Thysanoessa spinifera	CPS	–	X	X
		Nyctiphanes simplex	CPS	–	X	X
		Nematocelis difficilis	CPS	–	X	X
		T. gregaria	CPS	–	X	X
		E. recurva	CPS	–	X	X
		E. gibboides	CPS	–	X	X
		E. eximia	CPS	–	X	X

Family	Common Name	Scientific Name	EFH		Designated EFH by Reach	
			FMP	Upper Eel River Below Scott Dam	Lower Eel River*	Eel River Estuary
Clupeidae	Pacific herring	*Clupea pallasii pallasii*	CPS	–	X	X
Atherinopsidae	Jacksmelt	*Atherinopsis californiensis*	CPS	–	X	X

Sources: PFMC 2024a, 2024c, and 2023.

* The lower Eel River is upstream to the Van Duzen River for CPS, upstream to approximately RM 26 near Stafford for PCG, and upstream to Middle Fork Eel River for PCS.

Notes: EFH is a component of every FMP managed by the PFMC including coastal pelagic species (CPS), highly migratory species (HMS), Pacific Coast groundfish (PCG), and Pacific Coast salmon (PCS).

Chinook Salmon

Chinook salmon in the Eel River are part of the California Coastal ESU, and the species is listed as threatened under the ESA (NMFS 2016a) and as a CDFW SSC (CNDDB 2024). NMFS considers Chinook salmon populations in the Eel River to consist of two independent populations, a lower Eel River population and an upper Eel River population. Chinook salmon spawning in the Eel River and tributaries above the confluence with the South Fork Eel River are considered part of the upper Eel River population. Chinook salmon spawning in the South Fork Eel River and in the Eel River downstream of the South Fork Eel River confluence are part of the lower Eel River population. This species is confirmed to be found throughout the Project vicinity Downstream of Scott Dam (see Table 3.3.3.3).

Coho Salmon

Coho salmon in the Eel River are considered part of the Southern Oregon/Northern California Coast coho salmon ESU, and the species is listed as threatened under both the ESA (NMFS 2005) and CESA (CDFG 2004; California Fish and Game Commission [CFGC] 2005). Coho salmon in the upper Eel River and tributaries between Dos Rios and Tomki Creek (including the Outlet Creek and Tomki Creek watersheds) are listed in the Southern Oregon and Northern California Coast Coho Recovery Plan as part of the middle mainstem Eel River population and considered high extinction risk (NMFS 2014a). In the Eel River and tributaries upstream of Tomki Creek, coho salmon are listed as part of upper mainstem Eel River population. Both populations are part of the Interior Eel River Diversity Stratum (NMFS 2014a). This species is confirmed to be found in the Project vicinity from Outlet Creek downstream to the Eel River Estuary (see Table 3.3.3.3).

Coastal Cutthroat Trout

Coastal cutthroat trout is listed as and as a CDFW SSC (CNDDB 2024). Although classified as an FSS, the species is not classified as an FSS in the MNF (USFS 2013). This species is confirmed to be found in the lower Eel River (e.g., below the North Fork Eel River) and the Eel River Estuary (see Table 3.3.3.3).

Green Sturgeon

Green sturgeon within the Eel River are part of the Northern DPS and listed as a California SSC (CNDDB 2024) and a species of concern by NMFS (2014b). A species of concern designation does not carry any procedural or substantive protections under the ESA. Rather, one of the goals of identifying a species of concern is to take proactive measures to address conservation needs and prevent the species from needing protection under the ESA. In addition, in April 2006, NOAA Fisheries listed the Southern DPS as threatened under the ESA. Although the Eel River is officially designated as part of the Northern DPS of green sturgeon, given its proximity to Humboldt Bay, which is documented feeding habitat for both Southern and Northern DPS, it is possible that any green sturgeon in the Eel River estuary could be of Southern or Northern DPS or a mix of both (Stillwater Sciences and Wiyot Tribe 2017). Only the Northern DPS of green sturgeon is confirmed to be found in the Project vicinity from the Middle Fork Eel River to the Eel River Estuary (see Table 3.3.3.3).

White Sturgeon

White sturgeon is listed as a California SSC (CNDDB 2024) and as a candidate species under the CESA (CDFW 2024c). This species is confirmed to be found in the Project vicinity in the Eel River Estuary (see Table 3.3.3.3).

Pacific Lamprey (SSC, FSS [MNF])

Pacific lamprey is listed as a California SSC and an FSS species for the MNF (CNDDB 2024; USFS 2013). This species is confirmed to be found throughout the Project vicinity below Scott Dam (see Table 3.3.3.3).

Western River Lamprey (SSC)

Western river lamprey is listed as a California SSC (CNDDB 2024). This species may be present in the Project vicinity from Scott Dam to the Eel River Estuary, however only a single individual has been collected at Cape Horn Dam (Moyle 2002) (see Table 3.3.3.3).

Western Brook Lamprey (SSC, FSS [MNF])

Western brook lamprey is listed as an FSS species for the MNF (USFS 2013) and as a CDFW SSC (CNDDB 2024). This species is confirmed to be found in the Project vicinity from above Lake Pillsbury (Moyle 2002) to the Eel River Estuary (see Table 3.3.3.3).

Tidewater Goby

Tidewater goby in the lower Eel River and Eel River estuary is listed as endangered under the ESA (USFWS 1994) and listed as a California SSC (CNDDB 2024). This species is confirmed to be found in the Eel River Estuary (see Table 3.3.3.3).

Pacific Eulachon

Pacific eulachon were considered by CDFW to be in the Eel River historically; however, currently they are probably extinct from the Eel River (Yoshiyama and Moyle 2010). Pacific eulachon are part of the Southern DPS of eulachon that ranges from central British Columbia to Washington, Oregon, and the Mad River in Northern California. This DPS is listed as threatened under the ESA (NMFS 2010b). This species is also listed as a California SSC (CNDDB 2024). The potential exists for eulachon to be found in the lower Eel River and Eel River Estuary (see Table 3.3.3.3).

Longfin Smelt

Longfin smelt in the lower Eel River Watershed and Eel River estuary is a proposed endangered species under the ESA and listed as a threatened species under the CESA (CDFG 2009; CNDDB 2024). This species is confirmed to be found in the lower Eel River and Eel River Estuary (CDFG 2009) (see Table 3.3.3.3).

Northern Coastal Roach (SSC)

Northern coastal roach (*Hesperoleucus venustus navarroensis*) is a CDFW SSC endemic to the Navarro and Russian River watersheds; however, a population of northern coastal roach has been introduced to the Eel River (Baumsteiger and Moyle 2019; CNDDB 2024). This species is confirmed to be found in the Eel River from Scott Dam to the Middle Fork Eel River (see Table 3.3.3.3).

Foothill Yellow-Legged Frog (SSC, FSS [MNF])

Foothill yellow-legged frogs in the vicinity of the Project are classified as the Northwest/North Coast clade. The clade is a USFS Region 5 FSS species in the MNF and a CDFW SSC (CNDDB 2024; USFS 2013). The Northwest/North Coast clade is not listed as a federal threatened or endangered species at this time (CFGC 2020) and does not have federal listing status (USFWS 2023a).

Northern Red-Legged Frog (SSC)

Northern red-legged frog is a California SSC (CNDDB 2024). This species is confirmed to be found in the Project vicinity, including in the Eel River from the Middle Fork Eel River to the Eel River Estuary (see Table 3.3.3-15).

Coastal Tailed Frog (SSC)

Coastal tailed frog is listed as a California SSC (CNDDB 2024). This species is not found in the Project vicinity, however, is confirmed to be found in Eel River tributaries outside of the Project influence (see Table 3.3.3-15).

Southern Torrent Salamander (SSC)

Southern torrent salamander is listed as a California SSC (CNDDB 2024). This species is confirmed in tributaries of the lower Eel River (see Table 3.3.3-15).

Northwestern Pond Turtle (SSC, FSS [MNF], FPT)

Northwestern pond turtle is a CDFW SSC and an FSS in the MNF (CNDDB 2024; USFS 2013). In addition, in October 2023, USFWS released a proposed rule to federally list the northwestern and the southwestern pond turtle as threatened (USFWS 2023b). Only the northwestern pond turtle is found in the Project vicinity, including Lake Pillsbury, the Eel River, and the East Branch Russian River.

California Floater

California floater mussel is an FSS; however, is not classified as an FSS in the MNF (USFS 2013). This species' historic range is within the Project vicinity and observations have been confirmed in the South Fork Eel River (Howard and Cuffey 2003).

Western Pearlshell (SSC)

Western pearlshell mussel is listed as a California SSC (CNDDB 2024). This species' historic range is within the Project vicinity. Observations have been confirmed in the Project vicinity upstream of Van Arsdale Reservoir and in the East Branch Russian River (PG&E 2019b).

3.3.3.12 References

Adams, P.B., C.B. Grimes, S.T. Lindley, and M.L. Moser. 2002. Status review for North American green sturgeon, *Acipenser medirostris*. NOAA, National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, CA.

AmphibiaWeb. 2024. AmphibiaWeb. University of California, Berkeley, CA. Available at: http://amphibiaweb.org. Accessed May 14, 2024.

Anderson, A. 2024. PG&E personal communication with K. Ross-Smith, Senior Principal, Stantec.

Baskerville-Bridges, B. and P.B. Moyle. 1989. Distribution, abundance, growth and diet of largemouth bass and Sacramento squawfish in Pillsbury Reservoir. University of California Davis Department of Wildlife and Fisheries Biology.

Baumsteiger, J. and P.B. Moyle. 2019. A reappraisal of the California roach/hitch (*Cypriniformes*, *Cyprinidae*, *Hesperoleucus*/*Lavinia*) species complex. Zootaxa 4543 (2):221–240. Available at: https://doi.org/10.11646/zootaxa.4543.2.3.

Beak Consultants, Inc., and Prolysts, Inc. 1984. Coyote Valley Dam fish mitigation study. Prepared for U.S. Army Corps of Engineers, Sacramento District, CA.

Beak Consultants, Inc. 1986. Article 41 studies to determine the effects of water temperature on downstream migration of anadromous salmonids in the upper Eel River below Lake Pillsbury. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

Bouma-Gregson K., R.M. Kudela, and M.E. Power. 2018. Widespread anatoxin-a detection in benthic cyanobacterial mats throughout a river network. PLoS ONE 13(5): e0197669. https://doi.org/10.1371/journal.pone.0197669.

Brown, W. and J. Ritter. 1971. Sediment transport and turbidity in the Eel River basin, California. U.S. Geological Survey Water Supply Paper 1986.

Bureau of Land Management. 2023. BLM, Wiyot Tribe, and UC Berkeley partner to improve Eel River fishery [press release]. Available at: https://www.blm.gov/press-release/blm-wiyot-tribe-and-uc-berkeley-partner-improve-eel-river-fishery.

Butler, D. 2012. Description of the recent block water release methodology and future water release management objectives. Presentation at Eel Russian River Commission meeting, July 30, 2012, Eureka, CA.

CalFish (California Cooperative Anadromous Fish and Habitat Data Program). 2018. Coho salmon *Oncorhynchus kisutch*. Available at: https://www.calfish.org/FisheriesManagement/SpeciesPages/CohoSalmon.aspx#:~:text=On%20the%20Eel%20River%2C%20adult%20coho%20salmon%20return,and%20December.%20Timing%20varies%20by%20stream%20and%2For%20flow.

California Trout, Stillwater Sciences, Applied River Sciences, and University of California Berkeley. 2024. Eel River restoration and conservation plan—Phase 1: Planning—of the Eel River Watershed Restoration and Conservation Program. Prepared for California Department of Fish and Wildlife. June 2024. Available at: https://caltrout.org/wp-content/uploads/2024/06/Eel-River-RC-Plan_Final.pdf.

Cannata, S. and T. Hassler. 1995. Juvenile salmonid utilization of the Eel River estuary. California Cooperative Fishery Research Unit, Humboldt State University, Arcata.

Catenazzi, A. and S.J. Kupferberg. 2013. The importance of thermal conditions to recruitment success in stream-breeding frog populations distributed across a productivity gradient. Biological Conservation 168:40–48.

Catenazzi, A., and S.J. Kupferberg. 2017. Personal communication with R.C. Addley, Senior Science Consultant, Kleinschmidt.

CDFG (California Department of Fish and Game). 1959. Stream survey of Mewhinney Creek, East Fork Russian River. Mendocino County, CA. June.

CDFG (California Department of Fish and Game). 2004. Recovery strategy for California coho salmon. Prepared for California Fish and Game Commission. Available at: https://www.waterboards.ca.gov/water_issues/programs/tmdl/records/region_1/2010/ref3678.pdf.

CDFG (California Department of Fish and Game). 2009. California Department of Fish and Game report to the Fish and Game Commission: A status review of the longfin smelt *Spirinchus thaleichthys* in California, January 23. Available at: LongfinSmeltStatusReview.pdf (endangeredspecieslawandpolicy.com).

CDFG (California Department of Fish and Game). 2010. Lower Eel River watershed assessment. Coastal Watershed Planning and Assessment Program. Department of Fish and Game.

CDFW (California Department of Fish and Wildlife). 2015. Western river lamprey (*Lampetra ayresi*). California Fish Species of Special Concern, 3rd edition. California Department of Fish and Wildlife and the University of California, Davis. Available at: https://wildlife.ca.gov/Conservation/SSC/Fishes.

CDFW (California Department of Fish and Wildlife). 2016a. Lake Pillsbury, Lak County, 2016 creel census and trout evaluation study. California Department of Fish and Wildlife.

CDFW (California Department of Fish and Wildlife). 2020. Ocean Ranch Restoration Project draft environmental impact report. Section 3.4, biological resources. October. Available at: https://wildlife.ca.gov/Regions/1/Ocean-Ranch-Restoration-Project.

CDFW (California Department of Fish and Wildlife). 2023. A petition to the State of California Fish and Game Commission from San Francisco Baykeeper, the Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance to list white sturgeon (*Acipenser transmontanus*) as threatened under the California Endangered Species Act. California Department of Fish and Wildlife. November 2023. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=218302&inline.

CDFW (California Department of Fish and Wildlife). 2024a. California Natural Diversity Database (CNDDB). RareFind 5 and spotted owl observations database. Available at: https://wildlife.ca.gov/Data/CNDDB.

CDFW (California Department of Fish and Wildlife). 2024b. Provisional fish release plans for the current calendar year. Available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=74004&inline.

CDFW (California Department of Fish and Wildlife). 2024c. News archive. Fish and Game Commission approves white sturgeon as a candidate species for listing as threatened. Available at: https://wildlife.ca.gov/News/Archive/fish-and-game-commission-approves-white-sturgeon-as-a-candidate-species-for-listing-as-threatened. Accessed July 2024.

CFGC (California Fish and Game Commission). 2005. Office of Administrative Law's ID #04-0225-01, Section 670.5, Title 14, CCR, coho salmon. Available at: http://www.fgc.ca.gov/regulations/2004/.

CFGC (California Fish and Game Commission). 2020. California Fish and Game Commission notice of findings for foothill yellow-legged frog. March 10. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=177905&inline.

CNDDB (California Natural Diversity Database). 2024. State and federally listed endangered and threatened animals of California. California Department of Fish and Wildlife, Sacramento, CA.

Cooper, E.J., A.P. O'Dowd, J.J. Graham, D.W. Mierau, W.J. Trush, and R. Taylor. 2020. Salmonid habitat and population capacity estimates for steelhead trout and Chinook salmon upstream of Scott Dam in the Eel River, California. Northwest Science 94(1):70–96. Available at: https://eelriver.org/wp-content/uploads/2024/03/Cooper-et-al-2020_NWSci-94-1-pp70-96-2.pdf.

Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2009. Contaminants in fish from California lakes and reservoirs: technical report on year one of a two-year screening survey. A report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.

Dever, J.A. 2007. Fine-scale genetic structure in the threatened foothill yellow-legged frog (*Rana boylii*). Journal of Herpetology 41:168–173.

Ellison, J.P. 1982. Lake Pillsbury hypolimnion aeration system: initial feasibility study. California Department of Fish and Game, Inland Fisheries, Region 3.

ERF (Eel River Forum). 2016. The Eel River action plan: A compilation of information and recommended actions. Final report. Prepared for the Eel River Forum.

Fellers, G.M. 1996. 1995 aquatic amphibian surveys, Mendocino National Forest. National Biological Service, Point Reyes, CA.

FERC (Federal Energy Regulatory Commission). 1978. Final environmental impact statement, Potter Valley Project, No. 77-California. December.

FERC (Federal Energy Regulatory Commission). 2000. Final environmental impact statement, proposed changes in minimum flow requirements at the Potter Valley Project. FERC Project No. 77-110, California. May.

FERC (Federal Energy Regulatory Commission). 2004. Order amending FERC license. January 28.

Gerstung, E. 1984. Coastal streams surveyed in 1984, electrofishing sections 200' 300'. California Department of Fish and Game, Inland Fisheries Division, Sacramento. 2 pp.

Hayes, M.P., C.A. Wheeler, A.J. Lind, G.A. Green, and D.C. Macfarlane, tech. coords. 2016. Foothill yellow-legged frog conservation assessment in California. General Technical Report PSW-GTR-248. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA. 193 pp.

Hokanson, K.E.F., C.F. Kleiner, and T.W. Thorslund. 1977. Effects of constant temperatures and diel temperature fluctuations on specific growth and mortality rates and yield of juvenile rainbow trout, *Salmo gairdneri*. Journal of Fisheries Research Board of Canada 34:639–648.

Howard, J.K.J., L. Furnish, J. Brim Box, and S. Jepsen. 2015a. The decline of native freshwater mussels (*Bivalvia*: *Unionoida*) in California as determined from historical and current surveys. California Fish and Game 101(1):8–23.

Howard, J.K., K.R. Klausmeyer, K.A. Fesenmyer, J. Furnish, T. Gardali, T. Grantham, J.V.E. Katz, S. Kupferberg, P. McIntyre, P.B. Moyle, P.R. Ode, R. Peek, R.M. Quiñones, A.C. Rehn, N. Santos, S. Schoenig, L. Serpa, J.D. Shedd, J. Slusark, J.H. Viers, A. Wright, and S.A. Morrison. 2015b. Patterns of freshwater species richness, endemism, and vulnerability in California. PLoS ONE 10(7): e0130710. doi:10.1371/journal.pone.0130710.

Howard, J.K. and K.M. Cuffey. 2003. Freshwater mussels in a California North Coast Range river: occurrence, distribution, and controls. J.N. Am. Benthol. Soc., 22(1):63-77.

Hunter, B. 1983. Letter to M. Head, PG&E, from B. Hunter, CDFG, March 23.

iNaturalist. 2024. iNaturalist. Available at: https://www.inaturalist.org.

Israel, J.A., J.F. Cordes, M.A. Blumberg, and B. May. 2004. Geographic patterns of genetic differentiation among collections of green sturgeon. North American Journal of Fisheries Management 24:922–931.

Kubicek, P.F. 1977. Summer water temperature conditions in the Eel River system, with reference to trout and salmon. MS thesis, Humboldt State University, Arcata, CA.

Kubicek, P.F. 2017. PG&E Personal communication with R.C. Addley, Senior Science Consultant, Kleinschmidt.

Kupferberg, S.J., A. Catenazzi, and M.E. Power. 2011. The importance of water temperature and algal assemblage for frog conservation in northern California rivers with hydroelectric projects. CEC-500-2014-033. California Energy Commission, Public Interest Energy Research Program, Sacramento, CA. 96 pp.

Lake County. 2024. Annual report: 2023 Dreissenid mussel prevention program early detection monitoring. Lake County Watershed Protection District. March 29. Available at: Annual-Dreissenid-Mussel-Report-2023-FINAL (lakecountyca.gov).

Lindley, S.T., D.L. Erickson, M.L. Moser, G. Williams, O.P. Langness, B.W. McCovey Jr., M. Belchik, D. Vogel, W. Pinnix, J.T. Kelly, J.C. Heublein, and A.P. Klimley. 2011. Electronic tagging of green sturgeon reveals population structure and movements among estuaries. Transactions of the American Fisheries Society 140: 108–122.

McMillen (McMillen Jacobs Associates). 2021. Cape Horn Dam fish passage improvements. Prepared for Two-Basin Solution Partners. Draft technical memorandum, November.

Miller, D.J. and R.N. Lea. 1972. Guide to the coastal marine fishes of California.

Monroe, G.W., F. Reynolds, F. Reynolds, B.M. Browning, and J.W. Speth. 1974. Natural resources of the Eel River delta. Coastal Wetland Series #9, California Department of Fish and Game, 108 pp.

Moser, Mary L., P.R. Almeida, P.S. Kemp, and P.W. Sorenson. 2014. Lamprey spawning migration. In: Lampreys: biology, conservation, and control. Fish and Fisheries Series 37, Volume 1. November. Available at: https://link.springer.com/chapter/10.1007/978-94-017-9306-3_5.

Moyle, P.B. 2002. Inland fishes of California (second edition). University of California Press, Berkeley, CA.

Murphy, G.I. and J.W. De Witt, Jr. 1951. Notes on the fishes and fishery of the lower Eel River, Humboldt County, California. California Department of Fish and Game, 30 pp.

Myric, C.A. and J.J. Cech, Jr. 2001. Temperature effects on Chinook salmon and steelhead: a review focusing on California's Central Valley populations. Bay-Delta Modeling Forum Technical Publication 01-1.

Nakamoto, R.J. and B.C. Harvey. 2003. Spatial, seasonal, and size-dependent variation in the diet of Sacramento pikeminnow in the Eel River, Northwestern California. California Fish and Game 89: 30–45.

Nevada Irrigation District and PG&E. 2011. Fish entrainment. FERC No. 2266 and 2310.

NMFS (National Marine Fisheries Service). 2002. Biological opinion for the proposed license amendment for the Potter Valley Project (Federal Energy Regulatory Commission Project Number 77-110). NMFS Southwest Region. November 26.

NMFS (National Marine Fisheries Service). 2005. Endangered and threatened species: final listing determinations for 16 ESUs of West Coast salmon, and final 4(d) protective regulations for threatened salmon ESUs. Federal Register 70(123):37160–37204. Available at: https://www.govinfo.gov/content/pkg/FR-2005-06-28/pdf/05-12351.pdf.

NMFS (National Marine Fisheries Service). 2010a. Federal recovery outline: North American green sturgeon southern distinct population segment. Santa Rosa, CA.

NMFS (National Marine Fisheries Service). 2010b. Threatened status for southern distinct population segment of eulachon. March 18. Available at: https://www.federalregister.gov/documents/2010/03/18/2010-5996/endangered-and-threatened-wildlife-and-plants-threatened-status-for-southern-distinct-population.

NMFS (National Marine Fisheries Service). 2011. Endangered and Threatened Species; Designation of Critical Habitat for the Southern Distinct Population Segment of Eulachon October 20. Available at: https://www.govinfo.gov/content/pkg/FR-2011-10-20/pdf/2011-26950.pdf.

NMFS (National Marine Fisheries Service). 2014a. Final recovery plan for the Southern Oregon/Northern California Coast evolutionarily significant unit of coho salmon (*Oncorhynchus kisutch*). NMFS, West Coast Region, Arcata, CA. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/marblemountain/exhibits/nat_marine_fs_exhibits/nmfs_31.pdf.

NMFS (National Marine Fisheries Service). 2014b. 2014 Informal status review for the northern distinct population segment of the North American green sturgeon (*Acipenser medirostris*). November 20. Available at: https://www.fisheries.noaa.gov/s3//dam-migration/20nov2014_ndps_greensturgeon_review_final.pdf.

NMFS (National Marine Fisheries Service). 2016a. Coastal multispecies recovery plan. NMFS, West Coast Region, Santa Rosa, CA. Available at: https://www.fisheries.noaa.gov/resource/document/final-coastal-multispecies-recovery-plan-california-coastal-chinook-salmon.

NMFS (National Marine Fisheries Service). 2016b. Final coastal multispecies recovery plan. National Marine Fisheries Service, West Coast Region, Santa Rosa, California. Available at: https://www.fisheries.noaa.gov/resource/document/final-coastal-multispecies-recovery-plan-california-coastal-chinook-salmon.

NOAA (National Oceanic and Atmospheric Administration). 2024. Critical habitat. Office of Protected Resources. March 3, 2024. Available at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/critical-habitat#definition-of-critical-habitat.

Office of the Federal Register. 2005. Endangered and threatened species; designation of critical habitat for seven evolutionarily significant units of Pacific salmon and steelhead in California; final rule. Federal Register 70(170):52488–52627.

PFMC (Pacific Fishery Management Council). 2022. Pacific Coast Fishery Ecosystem Plan. Pacific Fishery Management Council 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2023. Pacific Coast Groundfish Fishery Management Plan. Pacific Fishery Management Council 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2024a. Coastal Pelagic Species Fishery Management Plan, as Amended through Amendment 21. Pacific Fishery Management Council 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2024b. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species, Amended through Amendment 8. Pacific Fishery Management Council 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2024c. Pacific Coast Salmon Fishery Management Plan. Pacific Fishery Management Council 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

Pacific Southwest Inter-agency Committee. 1973. River mile index: Klamath River, Pacific Slope Basin, California - Oregon. Water Management Subcommittee, Pacific Southwest Inter-Agency Committee, Portland, OR.

PG&E (Pacific Gas and Electric Company). 2006a. Article 52(a). Pikeminnow monitoring and suppression results, 2005. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2006b. Article 52(a): Report Section 3. Summer water temperature monitoring results, 2005. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2006c. Article 52(a): Report Section 2. Summer rearing monitoring results, 2005. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2006d. Article 53. Chinook salmon carcass survey results, 2005. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2006e. Article 52(b). Annual performance report, 2005. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2007a. Article 52(a). Pikeminnow monitoring and suppression results, 2006. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2007b. Article 52(a). Summer water temperature monitoring results, 2006. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2007c. Article 52(a). Summer rearing monitoring results, 2006. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2007d. Article 53. Chinook salmon carcass survey results, 2005/06. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2007e. Article 52(b). Annual performance report, 2006. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2008a. Article 52(a). Pikeminnow monitoring and suppression results, 2007. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2008b. Article 52(a). Summer water temperature monitoring results, 2007. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2008c. Article 52(a). Summer rearing monitoring results, 2007. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2008d. Article 53. Chinook salmon carcass survey results, 2006/07. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2008e. Article 52(b). Annual performance report, 2007. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2009a. Article 52(a). Pikeminnow monitoring and suppression results, 2008. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2009b. Article 52(a). Summer water temperature monitoring results, 2008. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2009c. Article 52(a). Summer rearing monitoring results, 2008. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2009d. Article 53. Chinook salmon carcass survey results, 2007/08. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2009e. Article 52(b). Annual performance report, 2008. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2010a. Article 52(a). Pikeminnow monitoring and suppression results, 2009. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2010b. Article 52(a). Summer water temperature monitoring results, 2009. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2010c. Article 52(a). Summer rearing monitoring results, 2009. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2010d. Article 53. Chinook salmon carcass survey results, 2008/09. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2010e. Article 52(b). Annual performance report, 2009. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2011a. Article 52(a). Pikeminnow monitoring and suppression results, 2010. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2011b. Article 52(a). Summer water temperature monitoring results, 2010. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2011c. Article 52(a). Summer rearing monitoring results, 2010. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2011d. Article 53. Chinook salmon carcass survey results, 2009/10. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2011e. Article 52(b). Annual performance report, 2010. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2011f. Van Arsdale fish screen annual report, 2010. Potter Valley Hydroelectric Project, FERC Project No. 77. January.

PG&E (Pacific Gas and Electric Company). 2012a. Article 52(a). Pikeminnow monitoring and suppression results, 2011. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2012b. Article 52(a). Summer water temperature monitoring results, 2011. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2012c. Article 52(a). Summer rearing monitoring results, 2011. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2012d. Article 53. Chinook salmon carcass survey results, 2010/11. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2012e. Article 52(b). Annual performance report, 2011. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2012f. Van Arsdale fish screen annual report, 2011. Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2013a. Article 52(a). Pikeminnow monitoring and suppression results, 2012. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2013b. Article 52(a). Summer water temperature monitoring results, 2012. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2013c. Article 52(a). Summer rearing monitoring results, 2012. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2013d. Article 53. Chinook salmon carcass survey results, 2011/12. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2013e. Article 52(b). Annual performance report, 2012. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2013f. Van Arsdale fish screen annual report - 2012. Potter Valley Hydroelectric Project, FERC Project No. 77. January.

PG&E (Pacific Gas and Electric Company). 2014a. Article 52(a). Pikeminnow monitoring and suppression results, 2013. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2014b. Article 52(a). Summer water temperature monitoring results, 2013. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2014c. Article 52(a). Summer rearing monitoring results, 2013. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2014d. Article 53. Chinook salmon carcass survey results, 2012/13. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2014e. Article 52(b). Annual performance report, 2013. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2014f. Van Arsdale fish screen annual report - 2013. Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2014g. Quagga and zebra mussel early detection monitoring – 2014 results. Field Test Report # 028.21-151. Applied Technology Services, San Ramon, CA.

PG&E (Pacific Gas and Electric Company). 2015a. Article 52(a). Pikeminnow monitoring and suppression results, 2014. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2015b. Article 52(a). Summer water temperature monitoring results, 2014. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2015c. Article 52(a). Summer rearing monitoring results, 2014. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2015d. Article 53. Chinook salmon carcass survey results, 2013/14. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2015e. Article 52(b). Annual performance report, 2013. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2015f. Van Arsdale fish screen annual report - 2014. Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2016a. Article 52(a). Pikeminnow monitoring and suppression results, 2015. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2016b. Article 52(a). Summer water temperature monitoring results, 2015. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2016c. Article 52a. Summer rearing monitoring results, 2015. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2016d. Article 53. Chinook salmon carcass survey results, 2014/15. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2016e. Article 52(b) annual performance report, 2016. Potter Valley Hydroelectric Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2016f. Van Arsdale fish screen annual report, 2015. Potter Valley Hydroelectric Project No. 77. January.

PG&E (Pacific Gas and Electric Company). 2016g. Van Arsdale fish screen operations plan addressing NMFS reasonable and prudent Measure 7, including emergency fish screen plan. Potter Valley Hydroelectric Project, FERC Project No. 77. Final draft. February 2016.

PG&E (Pacific Gas and Electric Company). 2017a. Article 52(a). Pikeminnow monitoring and suppression results, 2016. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2017b. Article 52(a). Summer water temperature monitoring results, 2016. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2017c. Article 52a. Summer rearing monitoring results, 2016. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2017d. Article 53. Chinook salmon carcass survey results, 2015/16. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2017e. Article 52(b) annual performance report, 2016. Potter Valley Hydroelectric Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2017f. Lake Pillsbury bathymetric survey – 2016. Prepared by PG&E Applied Technology Services. Report No. 026.11-16.3.

PG&E. (Pacific Gas and Electric Company). 2017g. Relicensing pre-application document (PAD). Volume 1: Public Information Section 1-7.

PG&E (Pacific Gas and Electric Company). 2018a. Article 52(a). Pikeminnow monitoring and suppression results, 2017. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2018b. Article 52(a). Summer water temperature monitoring results, 2017. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2018c. Article 52a. Summer rearing monitoring results, 2017. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2018d. Article 53. Chinook salmon carcass survey results, 2015/16. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2018e. Article 52(b) annual performance report, 2017. Potter Valley Hydroelectric Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2018f. Technical memorandum executive summary for Scott Dam fish ladder feasibility evaluation for PG&E. April 2018.

PG&E (Pacific Gas and Electric Company). 2019a. AQ-10 Special-status amphibians and aquatic reptiles study data memorialization. Technical study summary. December 30.

PG&E (Pacific Gas and Electric Company). 2019b. AQ-11 Special-status and invasive mollusks. Technical study summary. December 30.

PG&E (Pacific Gas and Electric Company). 2019c. AQ-2 Water temperature study data memorialization. Technical study summary. December 30.

PG&E (Pacific Gas and Electric Company). 2019d. AQ-3 Water quality study data memorialization. Technical study summary. December 30.

PG&E (Pacific Gas and Electric Company). 2019e. AQ-7 Fish passage study data memorialization. Technical study summary. December 30.

PG&E (Pacific Gas and Electric Company). 2019f. AQ-9 Fish populations study data memorialization. Technical study summary. December 30.

PG&E (Pacific Gas and Electric Company). 2019g. Article 52(a). Pikeminnow monitoring and suppression results, 2018. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2019h. Article 52(a). Summer water temperature monitoring results, 2018. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2019i. Article 52a. Summer rearing monitoring results, 2018. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2019j. Article 53. Chinook salmon carcass survey results, 2017/18. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2019k. Article 52(b) annual performance report, 2018. Potter Valley Hydroelectric Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2020a. Article 52(a). Pikeminnow monitoring and suppression results, 2019. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2020b. Article 52(a). Summer water temperature monitoring results, 2019. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2020c. Article 52a. Summer rearing monitoring results, 2019. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2020d. Article 53. Chinook salmon carcass survey results, 2018/19. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2020e. Article 52(b) annual performance report, 2019. Potter Valley Hydroelectric Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2021a. Article 52(a). Pikeminnow monitoring and suppression results, 2020. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2021b. Article 52(a). Summer water temperature monitoring results, 2020. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2021c. Article 52a. Summer rearing monitoring results, 2020. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2021d. Article 53. Chinook salmon carcass survey results, 2019/20. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2021e. Article 52(b) annual performance report, 2020. Potter Valley Hydroelectric Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2022a. Article 52(a). Pikeminnow monitoring and suppression results, 2021. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

PG&E (Pacific Gas and Electric Company). 2022b. Article 52(a). Summer water temperature monitoring results, 2021. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2022c. Article 52(a). Summer rearing monitoring results, 2021. Addressing NMFS Measure 8 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2022d. Article 53. Chinook salmon carcass survey results, 2020/21. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2022e. Article 52(b). Annual performance report, 2021. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2023a. Article 52(b). Annual performance report, 2022. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2023b. Article 52(a): summer water temperature monitoring, 2022. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2023c. 2022 Summer rearing monitoring fish population surveys. Article 52(a); NMFS RPA Section G.2 and RPM 8. Potter Valley Hydroelectric Project, FERC Project No. 77. June.

PG&E (Pacific Gas and Electric Company). 2023d. Article 52(a). Pikeminnow monitoring and suppression results, 2022. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May

PG&E (Pacific Gas and Electric Company). 2024a. Article 52(a): summer water temperature monitoring, 2023. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project, FERC Project No. 77. April.

PG&E (Pacific Gas and Electric Company). 2024b. Article 52(b). Annual performance report, 2023. Potter Valley Hydroelectric Project, FERC Project No. 77. August.

PG&E (Pacific Gas and Electric Company). 2024c. Article 52(a). Pikeminnow monitoring and suppression results, 2023. Addressing NMFS RPA Section G.2 and Measures 1 and 2 (in part). Potter Valley Hydroelectric Project, FERC Project No. 77. May.

Placer County Water Agency. 2011. AQ7-Entrainment Technical Study Report 2011. FERC No. 2079.

Puckett, L. 1973. Memo: Progress report - study of the Eel River estuary. California Department of Fish and Game, Sacramento, 13 pp.

Puckett, L. 1977. The Eel River - observations on morphometry, fishes, water quality and invertebrates. Memorandum report. California Department of Fish and Game, 21 pp.

Puckett, L.K. 1976. Observations on the downstream migrations of anadromous fishes within the Eel River system. CDFG memorandum report.

Reese, C.D. and B.C. Harvey. 2002. Temperature-dependent interactions between juvenile steelhead and Sacramento pikeminnow in laboratory streams. Transactions of the American Fisheries Society 131:599–606.

Rehn, A.C., R.D. Mazor, and P.R. Ode. 2015. The California Stream Condition Index (CSCI): A new statewide biological scoring tool for assessing the health of freshwater streams. SWAMP technical memorandum SWAMP-TM-2015-0002.

Reid, S.B. 2017. Western Fishes – Lamprey Program, personal communication with R.C. Addley, Senior Science Consultant, Kleinschmit.

Reid, S.B. and D.H. Goodman. 2016. Free-swimming speeds and behavior in adult Pacific lamprey, *Entosphenus tridentatus*. Environmental Biology of Fishes 99(12). DOI 10.1007/s10641-016-0537-2.

Ritter, J.R. 1972. Sand transport by the Eel River and its effect on nearby beaches. U.S. Geological Survey Open-file Report 1972. Available at: https://pubs.usgs.gov/of/1973/0236/report.pdf.

Schlosser, S. and A. Eicher. 2012. The Humboldt Bay and Eel River estuary benthic habitat project. California Sea Grant Publication T-075. 246 pp.

SEC. 1996. Potter Valley Project Monitoring Program (FERC No. 77, Article 39): Effects of operations on upper Eel River anadromous salmonids, 1994/95 progress report and 1995/96 preliminary data. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

SEC. 1998. Potter Valley Project Monitoring Program (FERC Project Number 77-110, Article 39): Effects of operations on upper Eel River anadromous salmonids. Final report. March. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

Sonoma Water. 2016. Fish habitat flows and water rights project draft environmental impact report. August.

Spence, B.C., E.P. Bjorkstedt, J.C. Garza, J.J. Smith, D.G. Hankin, D. Fuller, W.E. Jones, R. Macedo, T.H. Williams, and E. Mora. 2008. A framework for assessing the viability of threatened and endangered salmon and steelhead in the North-Central California Coast recovery domain. NOAA technical memorandum NMFS-SWFSC-423. 173 pp.

Stebbins, R.C. and S.M. McGinnis. 2012. Field guide to amphibians and reptiles of California, revised edition. University of California Press, Berkeley, and Los Angeles, CA.

Stillwater Sciences and Wiyot Tribe Natural Resources Department. 2016. Monitoring Pacific lamprey in lower Eel River basin: Pilot surveys and recommendations for long-term monitoring. Prepared by Stillwater Sciences, Arcata, CA, and Wiyot Tribe Natural Resources Department, Table Bluff, CA, for U.S. Fish and Wildlife Service, Sacramento, CA.

Stillwater Sciences and Wiyot Tribe Natural Resources Department. 2017. Status, distribution, and population of origin of green sturgeon in the Eel River: results of 2014–2016 studies. Prepared by Stillwater Sciences, Arcata, CA, and Wiyot Tribe, Natural Resources Department, Loleta, CA, for NOAA, Fisheries Species Recovery Grants to Tribes, Silver Springs, MD. Available at: https://www.wiyot.us/DocumentCenter/View/126/Eel-River-Green-Sturgeon-Final-Report-PDF.

Stillwater Sciences. 2010. Pacific lamprey in the Eel River basin: A summary of current information and identification of research needs. Prepared for Wiyot Tribe, Loleta, CA.

Stillwater Sciences. 2014. Evaluation of barriers to Pacific lamprey migration in the Eel River basin. Prepared for Wiyot Tribe, Loleta, CA.

Stillwater Sciences, McBain Associates, McMillen Jacobs Associates, M. Cubed, Princeton Hydro, and Geosyntec Consultants. 2021. Potter Valley Project feasibility study: Capital improvements. Prepared by Stillwater Sciences and McBain Associates, Arcata, CA; McMillen Jacobs Associates, Boise, ID; M.Cubed, Davis, CA; Princeton Hydro, South Glastonbury, CT; and Geosyntec Consultants, Oakland, CA, for the Potter Valley Project planning agreement parties.

Sullivan, K., D.J. Martin, R.D. Cardwell, J.E. Toll, and S. Duke. 2000. An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria. Sustainable Ecosystems Institute, Portland, OR. Available at http://ww.w.krisweb.com/biblio/gen_sei_sullivanetal_2000_tempfinal.pdf.

SWRCB (State Water Resources Control Board). 2015. The perennial streams assessment (PSA): An assessment of biological condition using the new California Stream Condition Index (CSCI). SWAMP Technical Memorandum SWAMP-MM-2015-0001.

SWRCB (State Water Resources Control Board). 2016. Query of the California Environmental Data Exchange Network electronic database maintained by the State Water Resources Control Board for taxonomic results of historical benthic macroinvertebrate samples collected in Lake County, CA, and Mendocino County, CA. Available at: https://ceden.waterboards.ca.gov/Home/virtAqtTool.

Taylor, R.N. 2000. Humboldt County culvert inventory and fish passage evaluation. Final report, CDFG Agreement #FG 7068 IF. 39 pp. and appendices.

Trush, W.J. 1991. The influence of channel morphology and hydrology on spawning populations of steelhead trout in South Fork Eel River tributaries. University of California, Berkeley.

USACE (U.S. Army Corps of Engineers). 2016. Fishing at Lake Mendocino. Available at http://www.spn.usace.army.mil/Missions/Recreation/Lake-Mendocino/Fishing/.

USEPA (U.S. Environmental Protection Agency). 1978. U.S. Environmental Protection Agency national eutrophication survey working paper series report on Lake Pillsbury, Lake County California. EPA Region IX working paper No. 755. Corvallis Environmental Research Laboratory, Corvallis, OR, and Environmental Monitoring and Support Laboratory, Las Vegas, NV.

USEPA (U.S. Environmental Protection Agency). 2024. How's my waterway? Russian River, California. Available at: https://mywaterway.epa.gov/.

USFS and U.S. Bureau of Reclamation. 1995. Watershed analysis report for the upper main Eel River Watershed. Willows, CA.

USFS (U.S. Forest Service. 2013. List of Forest Service designated sensitive species on National Forests and Grasslands. September 9, 2013, update available at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5435266.xlsx.

USFWS (U.S. Fish and Wildlife Service). 1994. Endangered and threatened wildlife and plants: determination of endangered status for the tidewater goby. Federal Register 59(24):5494–5498. Available at: https://www.govinfo.gov/content/pkg/FR-1994-02-04/html/94-2546.htm.

USFWS (U.S. Fish and Wildlife Service). 2011. Asian clam (*Corbicula fluminea*) ecological risk screening summary. Available at: fws.gov/sites/default/files/documents/Ecological-Risk-Screening-Summary-Asian-Clam.pdf Accessed December 7, 2016.

USFWS (U.S. Fish and Wildlife Service). 2013. Endangered and threatened wildlife and plants; designation of critical habitat for tidewater goby. Federal Register 78(25):8746–8819. Available at: https://www.govinfo.gov/content/pkg/FR-2013-02-06/pdf/2013-02057.pdf.

USFWS (U.S. Fish and Wildlife Service). 2023a. Endangered and threatened wildlife and plants; foothill yellow-legged frog; threatened status with section 4(d) rule for two distinct population segments and endangered status for two distinct population segments. Federal Register 88 (166):59698–59727. Available at: https://www.fws.gov/sites/default/files/federal_register_document/2023-17675.pdf.

USFWS (U.S. Fish and Wildlife Service). 2023b. Endangered and threatened wildlife and plants; threatened species status with section 4(d) rule for the northwestern pond turtle and southwestern pond turtle. Federal Register 88(190):68370–68399. Available at: https://www.govinfo.gov/content/pkg/FR-2023-10-03/pdf/2023-21685.pdf.

USFWS (U.S. Fish and Wildlife Service). 2024. Information for Planning and Consultation (IPaC). Available at: IPaC: Home.

USGS (U.S. Geological Survey). 2024. NAS – nonindigenous aquatic species database. Available at: https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=1008.

Van Kirk, S. 1996. Historical accounts of the lower Eel (Wiyot) River navigation, fisheries, “angry waters,” land use, and the river environment 1850-1995. Prepared by Trinity Associates Arcata, CA.

Vladykov, V.D and W.I Follett. 2015. Western brook lamprey (*Lampetra richardsoni*). In: California Fish Species of Special Concern, 3rd edition. California Department of Fish and Wildlife and University of California, Davis. Available at: https://wildlife.ca.gov/Conservation/SSC/Fishes.

VTN (VTN Oregon Inc.). 1982. Potter Valley Project (FERC No. 77) fisheries study. Final report vols. I & II. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

White, J.L. and B.C. Harvey. 2001. Effects of an introduced piscivorous fish on native benthic fishes in a coastal river. Freshwater Biology 46:987–995.

Wiyot Tribe Natural Resources Department. 2024. Lhou’lhaqh (South Fork Eel River) Sacramento pikeminnow management plan. Prepared by Wiyot Tribe Natural Resources Department, Table Bluff, CA, for NOAA Fisheries Pacific Coastal Salmon Recovery Fund, Portland, OR.

Wurtsbaugh, W.A. and G.E. Davis. 1977a. Effects of fish size and ration level on the growth and food conversion efficiency of rainbow trout, *Salmo gairdneri Richardson*. Journal of Fish Biology 11:99–104.

Wurtsbaugh, W.A. and G.E. Davis. 1977b. Effects of temperature and ration level on the growth and food conversion efficiency of *Salmo gairdneri Richardson*. Journal of Fish Biology 1: 87–98.

Yoshiyama, R.M. and P.B. Moyle. 2010. Historical review of Eel River anadromous salmonids, with emphasis on Chinook salmon, coho salmon and steelhead. University of California at Davis. Center for Watershed Sciences working paper.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1990. California’s wildlife. Vol. I–III. California Department of Fish and Game, Sacramento, CA.

Zweifel, R.G. 1955. Ecology, distribution, and systematics of frogs of the *Rana boylii* group. University of California Publications in Zoology 54:207–292.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Figures

List of Maps

List of Acronyms

Cal-IPC	California Invasive Plant Council
CALVEG	Classification and Assessment with LANDSAT of Visible Ecological Groupings
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CE	California Endangered
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
FE	Federal Endangered
FERC	Federal Energy Regulatory Commission
ft.	feet
GIS	Geographic Information System
Ha	hectares
LANDSAT	Land Satellite
m	meter
mi.	miles
MNF	Mendocino National Forest

NWI	National Wetlands Inventory
PG&E	Pacific Gas and Electric Company
ppt	parts per trillion
Project	Potter Valley Hydroelectric Project
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

This Page Intentionally Left Blank

3.3.4 Botanical Resources

3.3.4.1 Introduction

This section describes the botanical resources in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). The Federal Energy Regulatory Commission (FERC) content requirements for botanical resources are specified in Title 18 of the Code of Federal Regulations (CFR) § 5.6(d)(3)(v), and a description of the floodplains, wetlands, and riparian and littoral habitats is specified in § 5.6(d)(3)(vi). In addition, this section describes rare, threatened, and endangered botanical resources in the Project vicinity. The FERC content requirements for this information are specified in § 5.6(d)(3)(vii).

3.3.4.2 Information Sources

Existing relevant information reviewed for botanical resources includes the following:

- Lake Pillsbury Boat Ramp Project Application for Letter of Permission (USACE 2015)
- Fish Habitat Flows and Water Rights Project—Vegetation and Wildlife (SCWA 2016)
- Biological Opinion for the Proposed License Amendment for the Potter Valley Project (FERC Project Number 77-110) (NMFS 2002)
- Proposed, Endangered, and Threatened Species and Designated Critical Habitat on or near the MNF, the Red Bluff Recreation Area, and/or the Genetic Resource Conservation Center. Prepared by MNF, Willows, California (USFS 2015)
- USFS (2016a) Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) spatial data
- National Wetland Inventory (NWI) spatial data (USFWS 2024a)
- GIS information from MNF on Non-Native Invasive Plant Species (USFS 2016b)
- Information presented in the TERR 1 – Botanical Resources Data Memorialization Technical Study Summary (PG&E 2019)
- The California Invasive Plant Council's (Cal-IPC's) California Invasive Plant Inventory (Cal-IPC 2024)

3.3.4.3 Botanical Resources

The following sections describe botanical resources that have been documented to be present or have the potential to be present in the Project vicinity, including vegetation communities, wetland resources, special-status plants, rare natural communities, and invasive weeds.

The study area for each botanical resource varies depending on habitat and species. The study area for assessing each botanical resource component is defined in each section below.

Vegetation Alliances and Common Plants

The study area for vegetation alliances includes (1) areas within 0.5 mi. of the FERC Project, and also the Eel River between Scott Dam and Van Arsdale Reservoir) and (2) areas within 0.25 mi. of the Eel River between Cape Horn Dam downstream to the Eel River estuary outlet into the Pacific Ocean, as well as the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino. This study area was determined to be the area sufficient to collect information on botanical resources that could potentially be affected by the Proposed Action.

Information on vegetation alliances was analyzed to characterize habitat conditions and identify common plant species in the Project vicinity. The term “alliance” corresponds closely to what plant ecologists refer to as a community type and foresters refer to as a forest type or stand. An alliance is characterized by the dominant species of plants (e.g., trees, shrubs, or herbaceous species) that make up the overstory. This usage is consistent with standards developed by the Federal Geographic Data Committee as part of the National Vegetation Classification System.

Information on vegetation alliances is based on Classification and Assessment with Land Satellite (LANDSAT) of Visible Ecological Groupings (CALVEG) mapping and vegetation alliance descriptions developed by U.S. Forest Service (USFS) Region 5. The CALVEG system is used to classify existing vegetation present on federally managed forestlands based on LANDSAT color infrared satellite imagery. Data were verified using soil–vegetation maps and professional guidance from various sources statewide. CALVEG data for the Mendocino National Forest (MNF) were updated by USFS in 2016.

Maps of vegetation alliances developed using CALVEG geographic information system (GIS) data layers for the North Coast (mid and west) mapping zone were overlain on a map of the Project. Descriptions of each vegetation alliance present within 1 mi., including descriptions of common plant species found in each alliance, were obtained from the USFS Region 5 website.

There are generally no regulatory protections associated with vegetation alliances. However, riparian and wetland habitats are afforded protections under Sections 1600–1607 of the California Fish and Game Code (as administered by the California Department of Fish and Wildlife [CDFW]) and under Section 404 of the Clean Water Act (under the jurisdiction of the U.S. Army Corps of Engineers [USACE]).

Since the time the CALVEG data layers were published, there have been three large wildfires in the Project vicinity, including the 2017 Redwood Valley Fire, the 2018 Ranch Fire, and the 2020 August Complex Fire. These fires have burned a total of 18,215 acres (approximately 20 percent) of the study area. These wildfires have likely resulted in significant alteration and conversion of the vegetation communities. Portions of the study area that burned at high severity likely converted from tree-dominated vegetation alliances to shrub-dominated vegetation alliances, and remaining tree-dominated patches are likely fragmented compared to pre-fire conditions (Steel et al. 2018; Coop et al. 2020). In particular, the Ranch Fire significantly altered vegetation communities on the east side of Lake Pillsbury, with some forest stands burned at total replacement. New CALVEG data layers (i.e., since 2016) for the study area are not available at the time of this report.

Refer to Table 3.3.4-1 for a list of vegetation alliances that occur in the Project vicinity and whether the alliance is a riparian- or wetland-associated alliance. Maps 3.3.4-1a through 3.3.4-1i show the extent of each CALVEG vegetation alliance and also the extent of recent wildfires in the study area. A description of each vegetation alliance, including common plant species associated with each alliance, is provided in Appendix 3.3.4-A.

Table 3.3.4-1. CALVEG vegetation alliances in the study area and riparian/wetland associations.

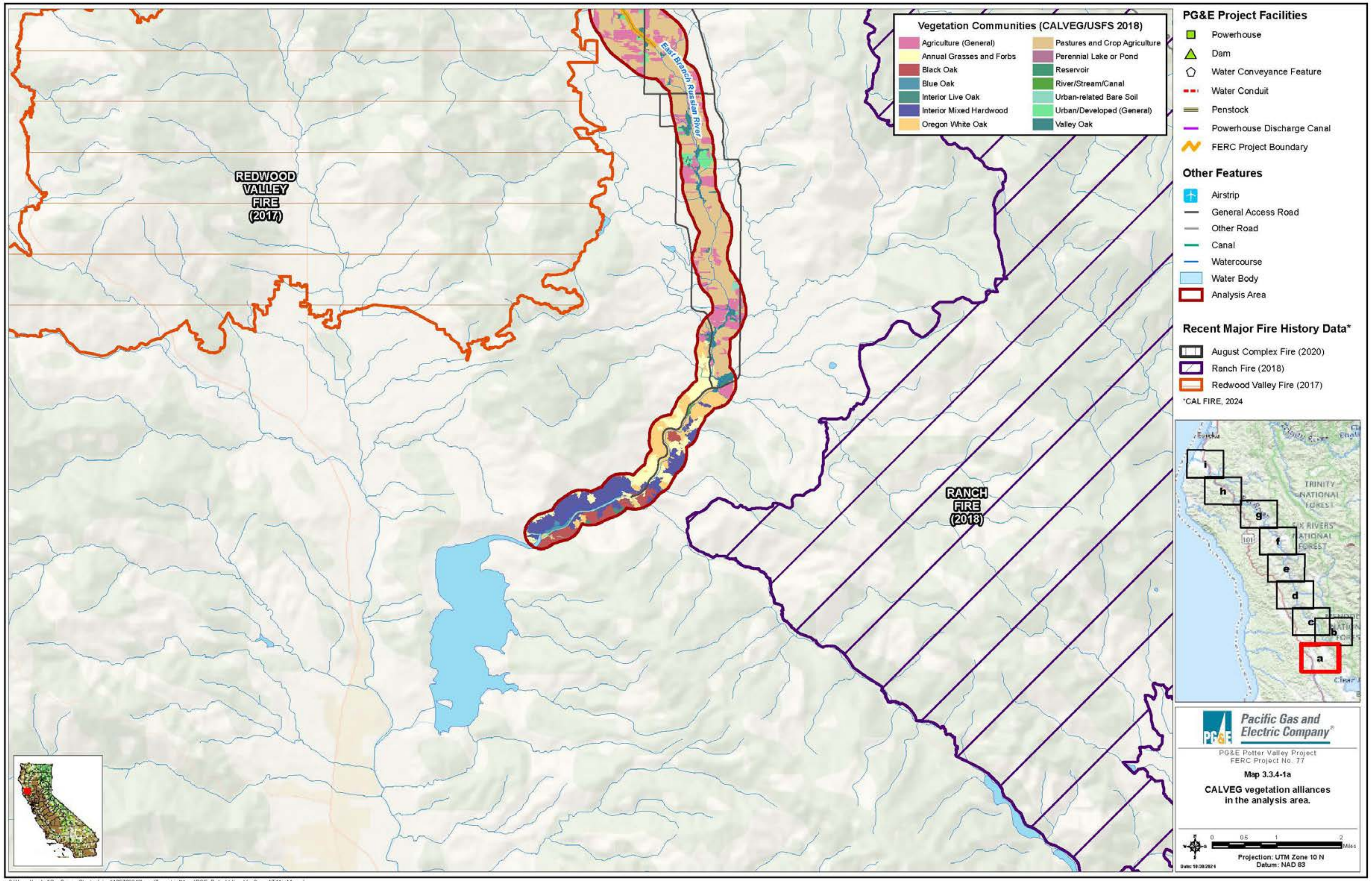
CALVEG Type	CALVEG Code	Riparian- or Wetland-Associated Alliance?
Herbaceous Vegetation Alliances		
Pastures and Crop Agriculture	A6	—
Pickleweed–Cordgrass	HC	**Yes**
Annual Grasses and Forbs	HG	—
Perennial Grasses and Forbs	HM	—
Shrub-Dominated Vegetation Alliances		
Chamise	CA	—
Salal–California Huckleberry	CB	—
Brewer Oak	CJ	—
Coyote Brush	CK	—
Wedgeleaf Ceanothus	CL	—
Lower Montane Mixed Chaparral	CQ	—
Scrub Oak	CS	—
Whiteleaf Manzanita	CW	—
Upper Montane Mixed Chaparral	CX	—
North Coast Mixed Shrub	NC	—
Riparian Mixed Shrub	NM	**Yes**
Blueblossom Ceanothus	SC	—
Manzanita Chaparral	SD	—
Willow (Shrub)	WL	**Yes**
Birchleaf Mountain Mahogany	WM	—
Tree-Dominated Vegetation Alliances		
Pacific Douglas-Fir	DF	—
Douglas-Fir–Ponderosa Pine	DP	—
Coastal Mixed Hardwood	EX	—
Knobcone Pine	KP	—

CALVEG Type	CALVEG Code	Riparian- or Wetland-Associated Alliance?
Mixed Conifer–Pine	MP	—
Riparian Mixed Hardwood	NR	**Yes**
Interior Mixed Hardwood	NX	—
Gray Pine	PD	—
Ponderosa Pine	PP	—
California Bay	QB	—
Canyon Live Oak	QC	—
Blue Oak	QD	—
White Alder	QE	**Yes**
Fremont Cottonwood	QF	**Yes**
Oregon White Oak	QG	—
Madrone	QH	—
Black Oak	QK	—
Valley Oak	QL	—
Willow	QO	**Yes**
Red Alder	QR	**Yes**
Tanoak (Madrone)	QT	—
Interior Live Oak	QW	—
Black Cottonwood	QX	**Yes**
Willow–Alder	QY	**Yes**
Eucalyptus	QZ	—
Redwood–Douglas-Fir	RD	—
Redwood	RW	—
Sitka Spruce	SK	—
Montane Mixed Hardwood	TX	—
Aquatic Vegetation Alliances		
Beach Sand	OS	—
River/Stream/Canal	W1	**Yes**
Perennial Lake or Pond	W2	**Yes**
Reservoir	W3	**Yes**
Ocean	W7	**Yes**
Intermittent Lake or Pond	W8	**Yes**

CALVEG Type	CALVEG Code	Riparian- or Wetland-Associated Alliance?
High Water Line/Gravel/Sand Bar	W9	**Yes**
Urban, Agriculture, or Barren		
Agriculture (General)	AG	—
Barren	BA	—
Dune	DU	—
Urban-related Bare Soil	IB	—
Urban/Developed (General)	UB	—

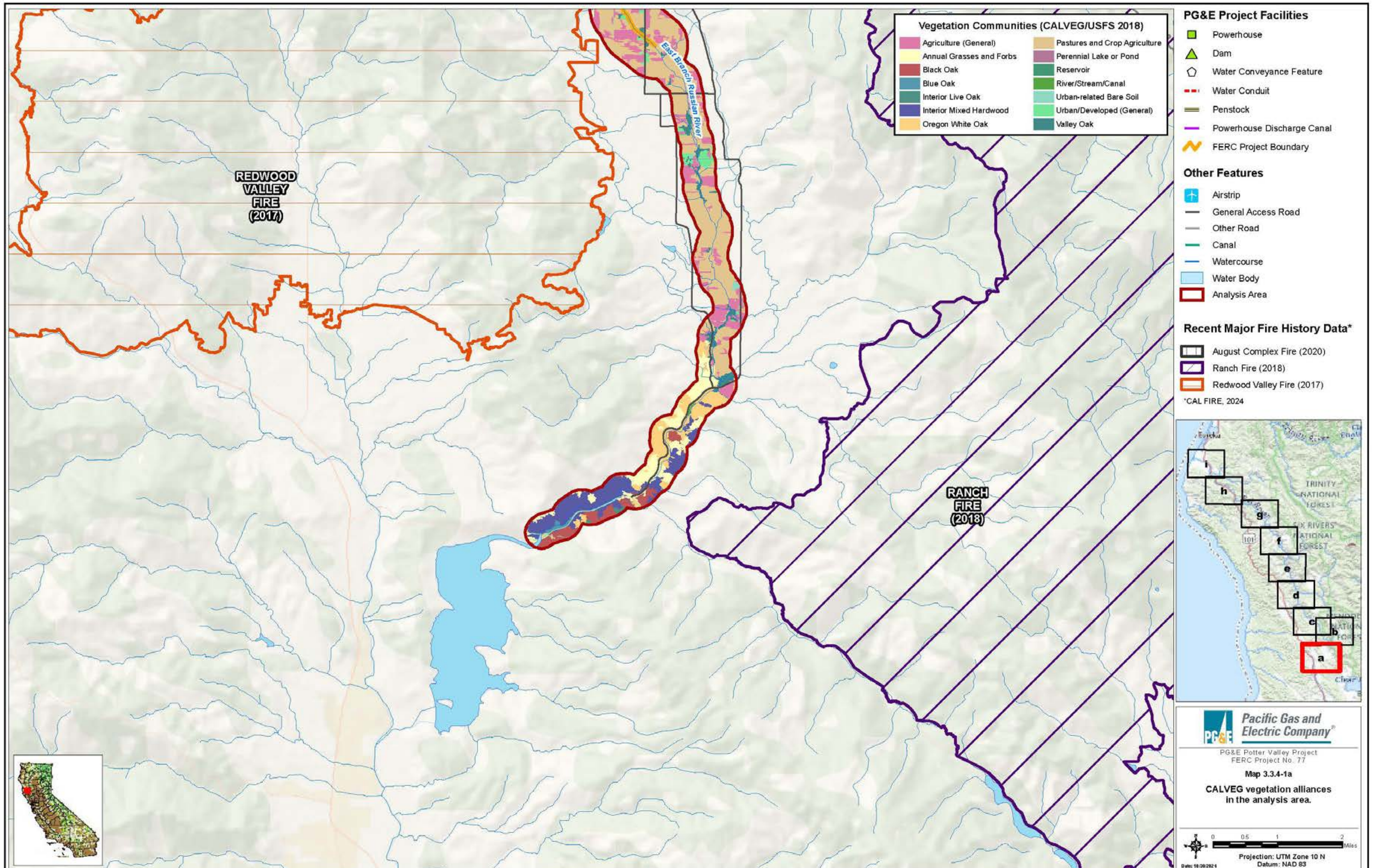
Note: The study area for vegetation alliances includes: (1) areas within 0.5 mi. of the FERC Project, and also the Eel River between Scott Dam and Van Arsdale Reservoir) and (2) areas within 0.25 mi. of the Eel River between Cape Horn Dam downstream to the Eel River estuary outlet into the Pacific Ocean, as well as the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino.

This Page Intentionally Left Blank



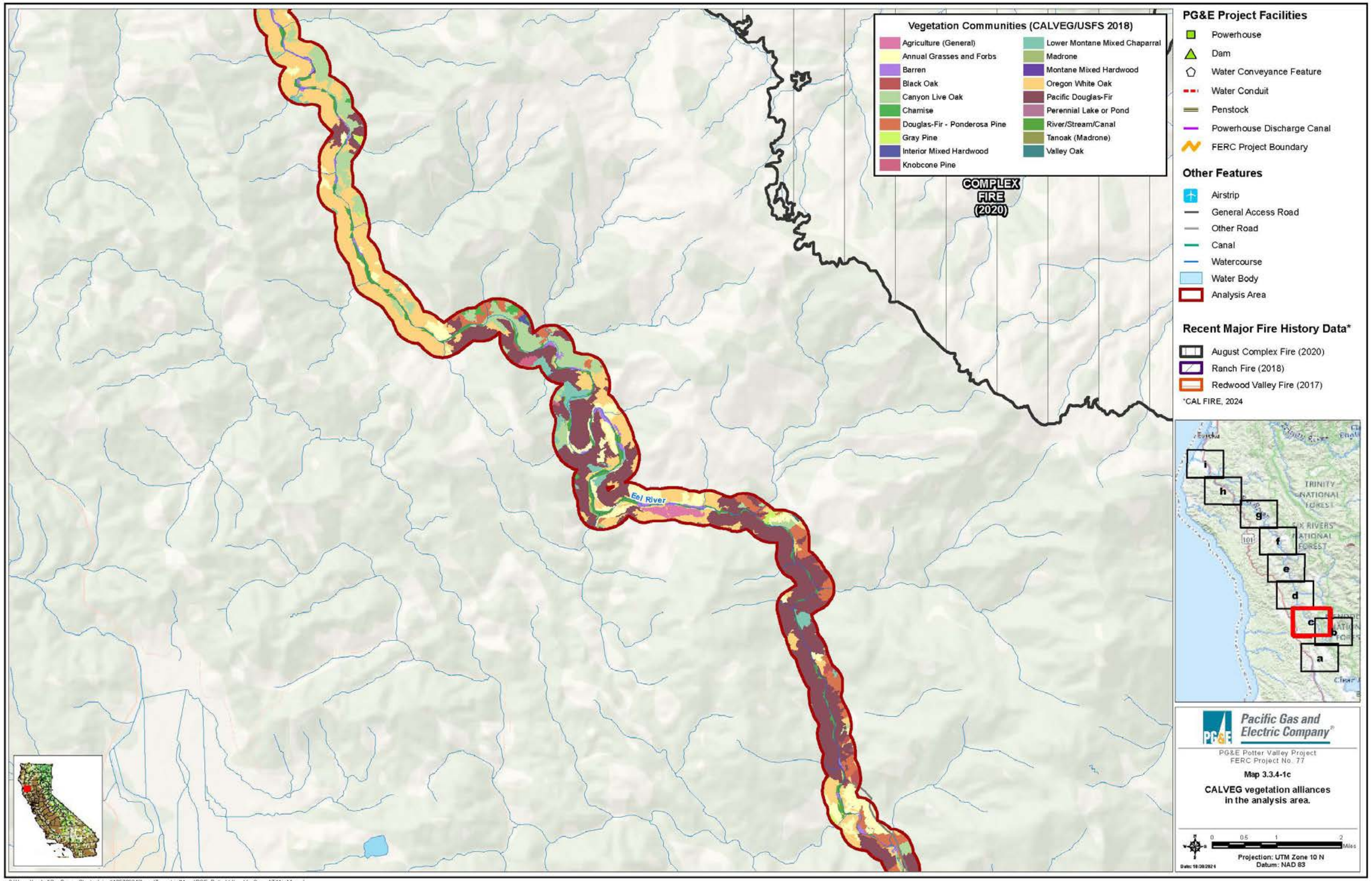
Map 3.3.4-1a CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



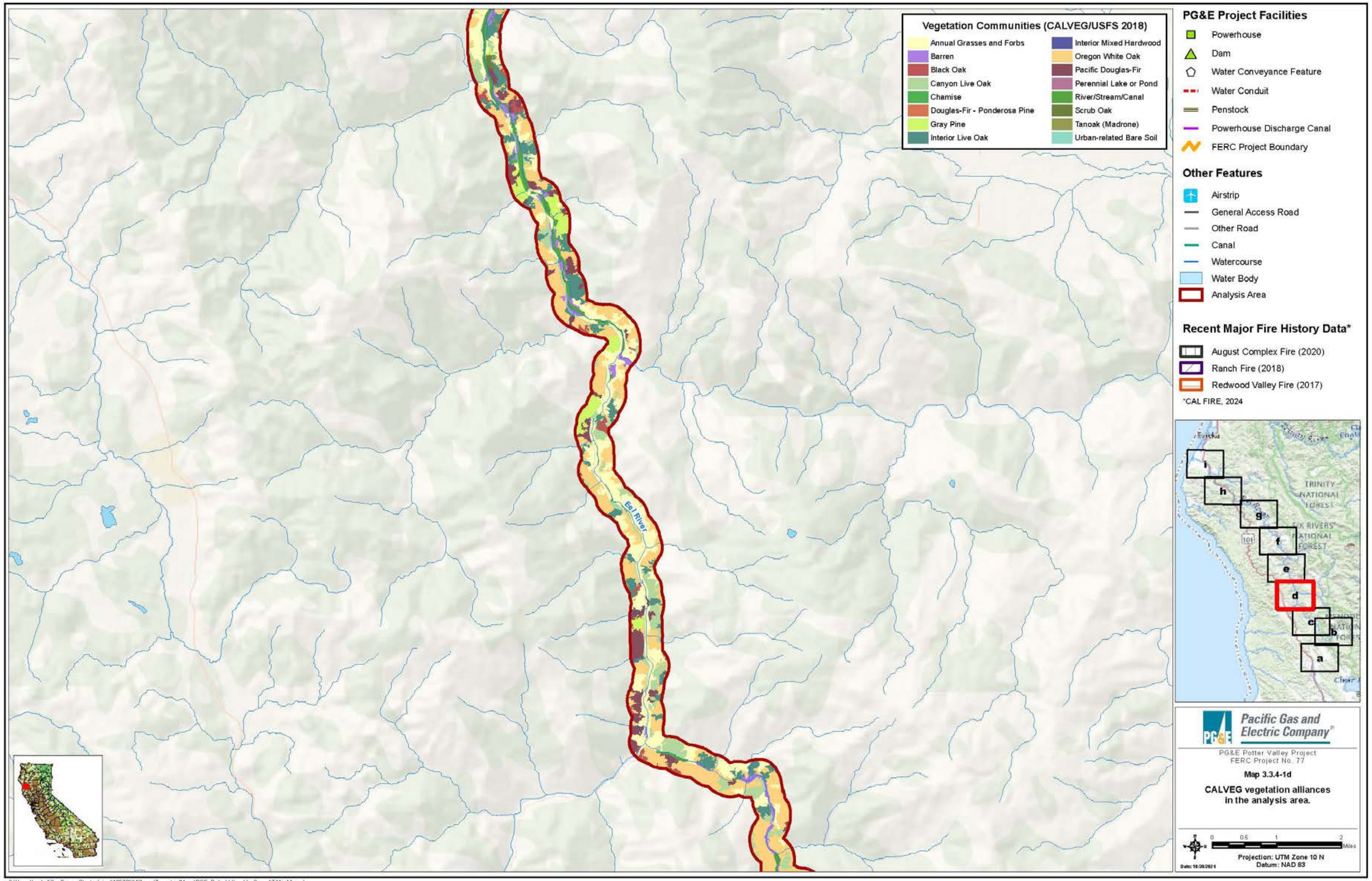
Map 3.3.4-1b CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



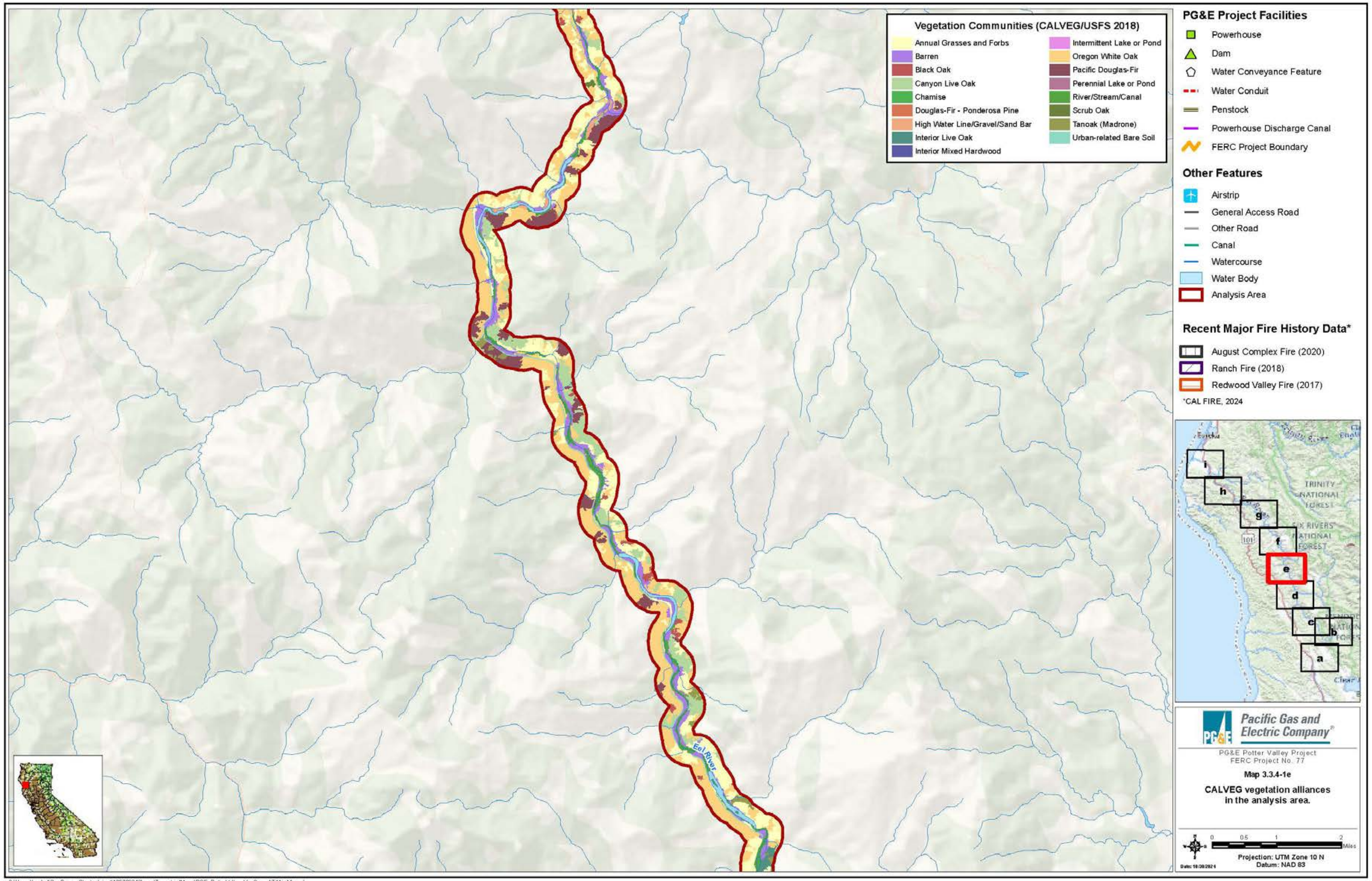
Map 3.3.4-1c CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



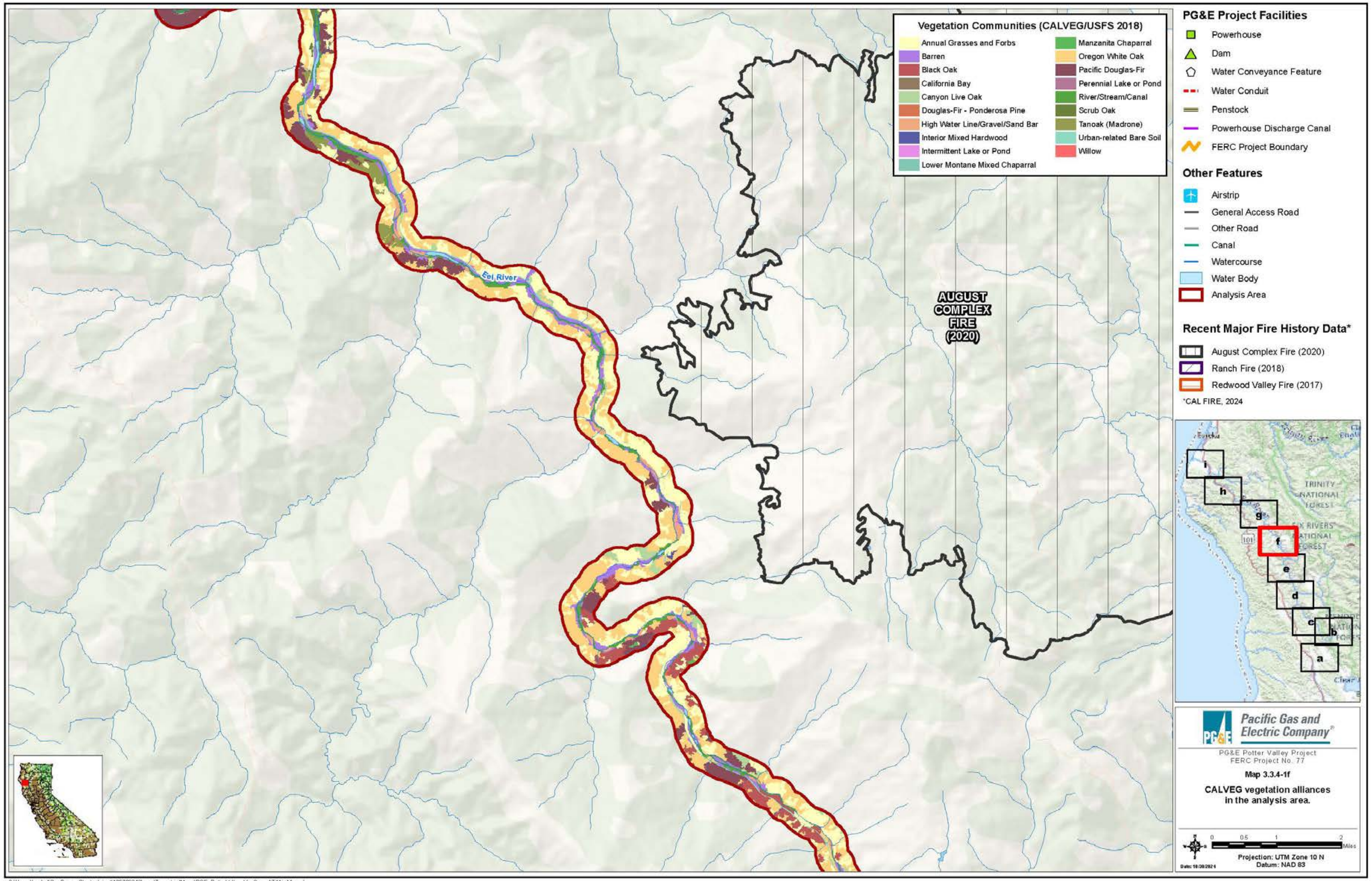
Map 3.3.4-1d CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



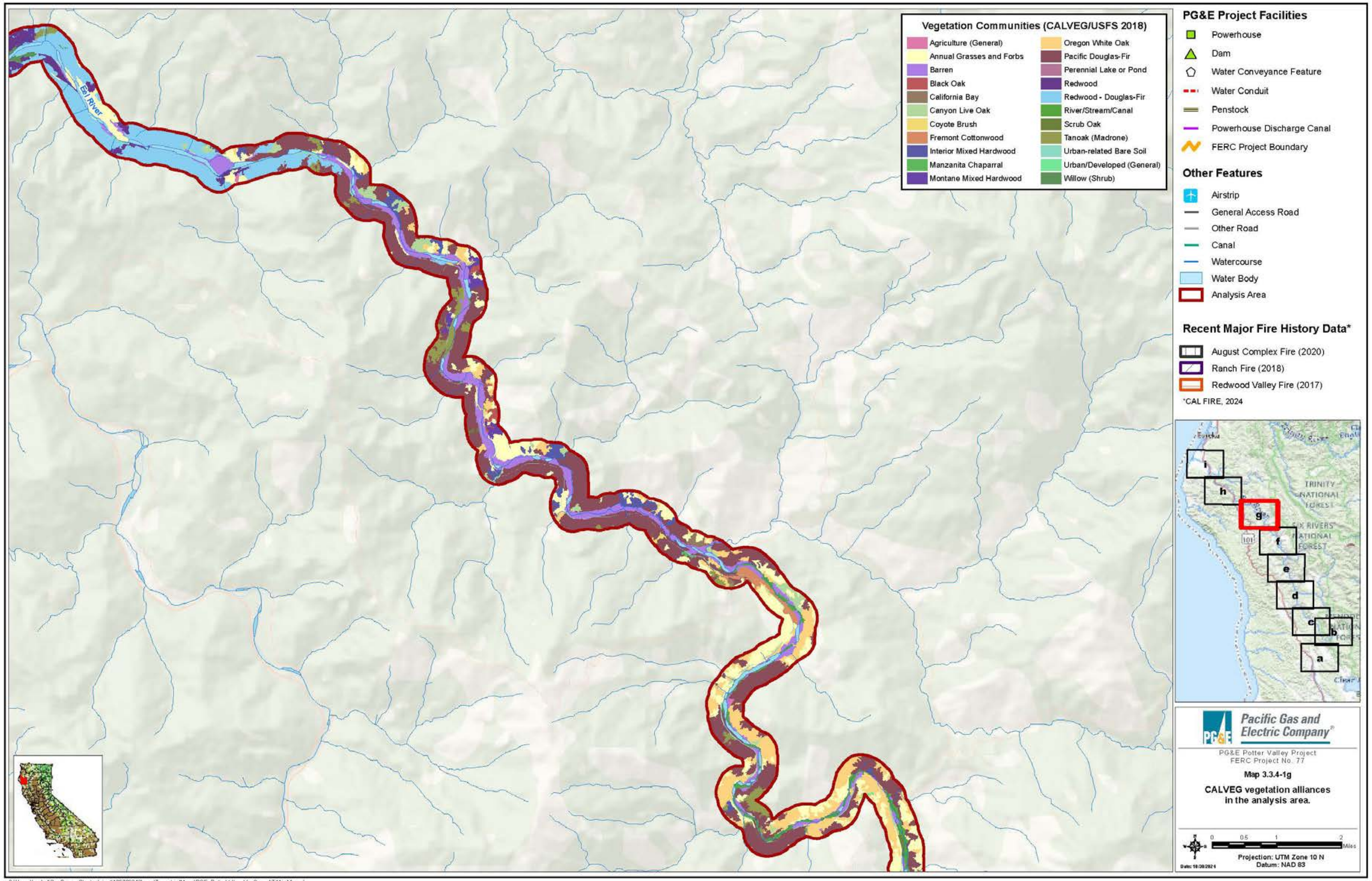
Map 3.3.4-1e CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



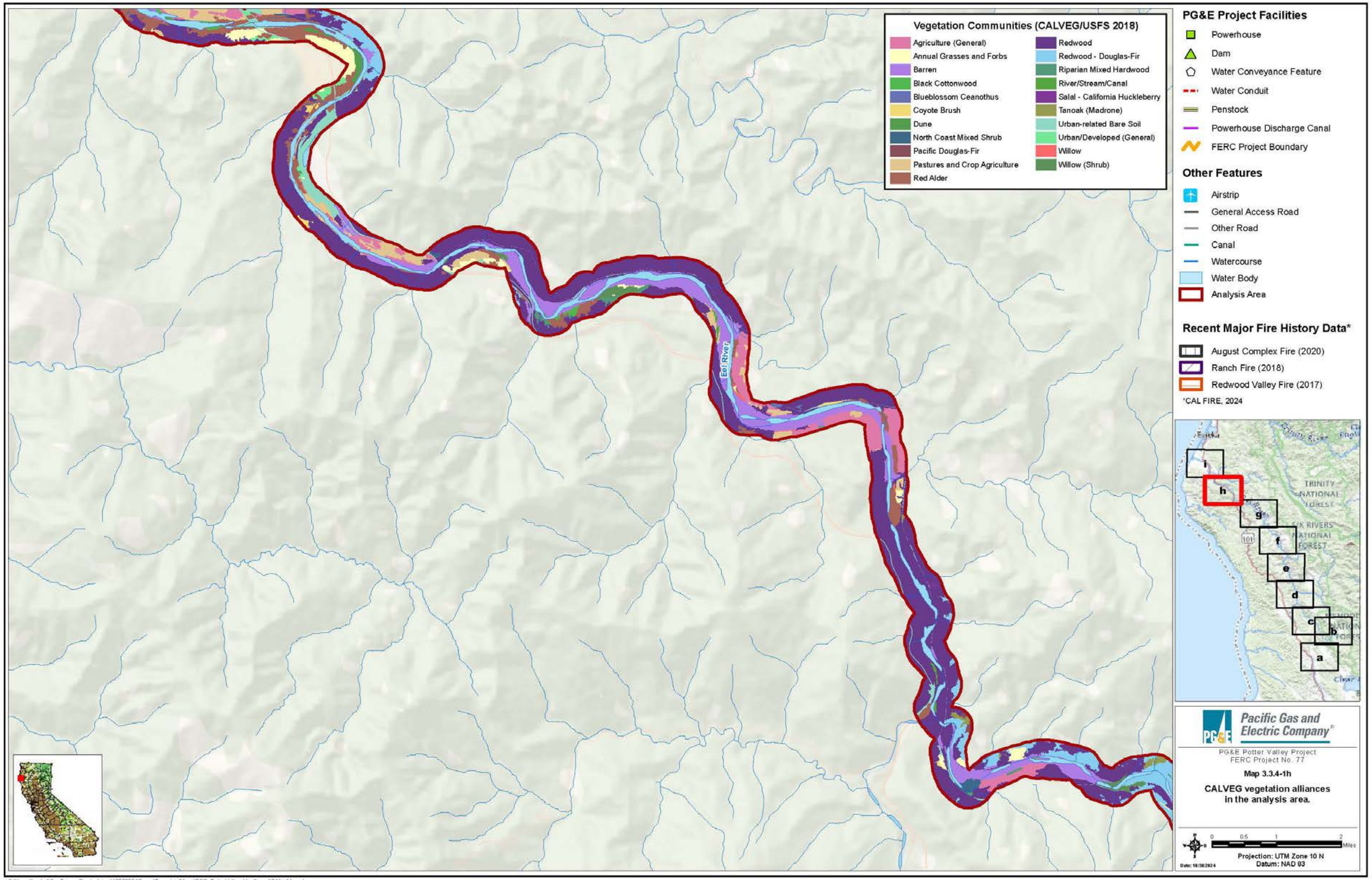
Map 3.3.4-1f CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



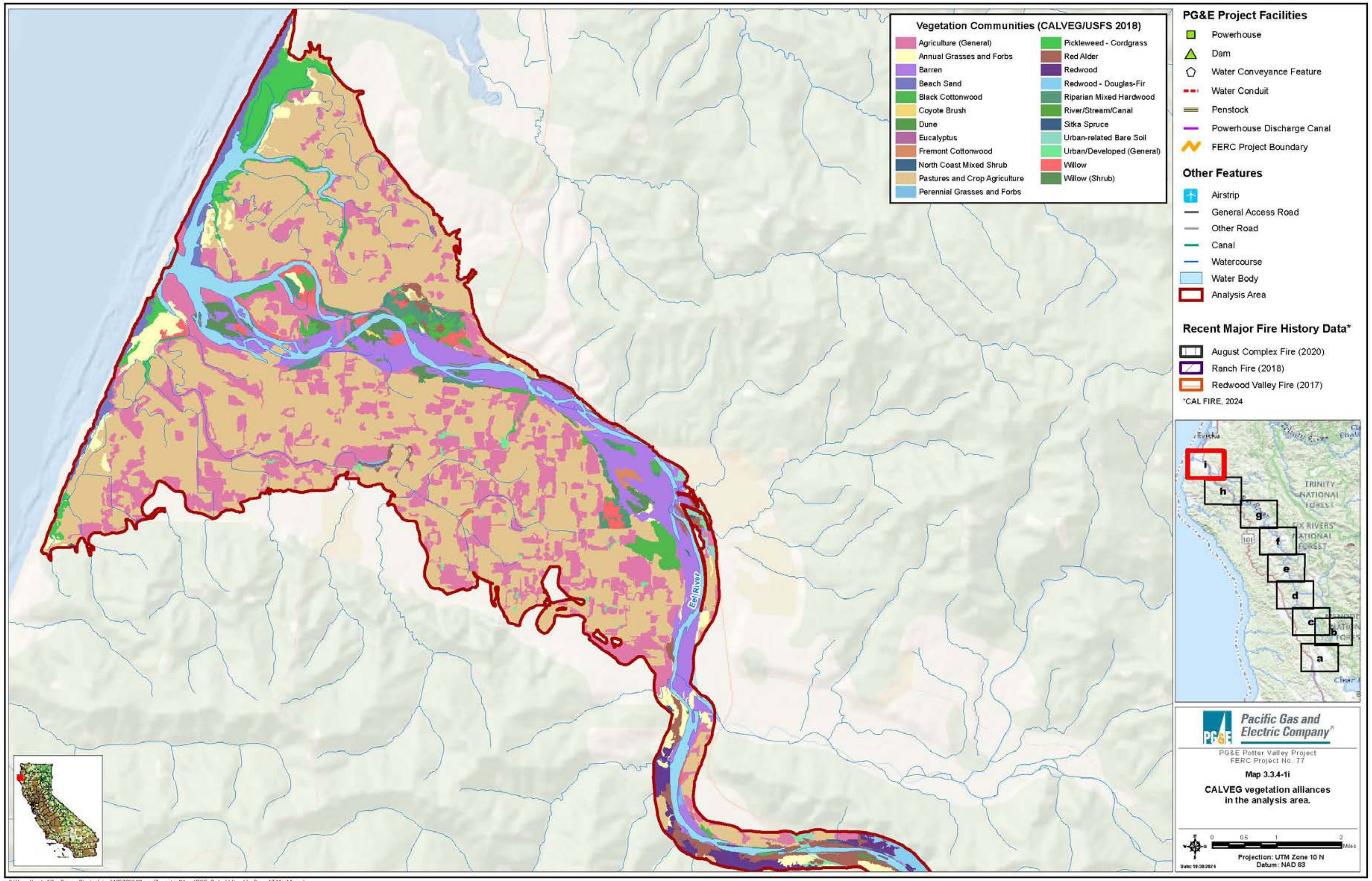
Map 3.3.4-1g CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



Map 3.3.4-1h CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank



Map 3.3.4-1i CALVEG vegetation alliances in the study area.

This Page Intentionally Left Blank

Special-Status Plants

Special-status plant species are defined as those species listed, proposed, or under review as rare, threatened, or endangered by the federal or state government; those designated by USFS as sensitive or watch list species within the MNF; and/or those on the CDFW Special Vascular Plants, Bryophytes, and Lichens List (CDFW 2024) with a California Rare Plant Rank (CRPR) of 1 or 2.

The study area for vegetation alliances includes (1) areas within 0.5 mi. of the FERC Project boundary, and also the Eel River between Scott Dam and Van Arsdale Reservoir and (2) areas within 0.25 mi. of the Eel River between Cape Horn Dam downstream to the Eel River estuary outlet into the Pacific Ocean, as well as the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino. The study area was chosen to provide a broad perspective of special-status plants that occur in the Project vicinity.

The list of special-status plant species that are known to occur or may potentially occur in the Project vicinity was developed by querying the following:

- U.S. Fish and Wildlife Service (USFWS) list of federally listed and proposed endangered, threatened, and candidate species (USFWS 2024b);
- California Native Plant Society (CNPS) online Inventory of Rare and Endangered Vascular Plants of California (CNPS 2024) for the U.S. Geological Survey (USGS) quadrangles surrounding the study area;
- CDFW's California Natural Diversity Database (CNDDB) (CNDDB 2024) USGS quadrangles surrounding the study area;
- USFS Pacific Southwest Region's (Region 5's) MNF documented occurrences of sensitive animals and sensitive and special-interest plants (USFS 2016b); and
- Results of the following botanical surveys conducted in the Project vicinity:
  - Biological Opinion for the Proposed License Amendment for the Potter Valley Project (FERC Project Number 77-110) (NMFS 2002)
  - Proposed Gravelly Valley Browseway Botany Certification for Sensitive and Survey and Manage Plant Species (Isle 2003)
  - Lake Pillsbury Boat Ramp Project Application for Letter of Permission (USACE 2015)
  - Proposed, Endangered, and Threatened Species and Designated Critical Habitat on or near the MNF, the Red Bluff Recreation Area, and/or the Genetic Resource Conservation Center (USFS 2015)
  - Fish Habitat Flows and Water Rights Project—Vegetation and Wildlife (Sonoma County Water Agency 2016)
  - TERR 1 – Botanical Resources Data Memorialization, Technical Study Summary (PG&E 2019)

Confidential Map 3.3.4-2a through Map 3.3.4-2i[1] depict the special-status plants that have been documented in this study area.

For the purposes of this section, plants were classified into two groups to assist in framing the environmental effects section, including the following:

1. Special-status plants that are known or may potentially occur within the FERC Project boundary or adjacent to Project facilities, including the Scott Dam Area (Scott Dam, Lake Pillsbury, and associated Project facilities and Project recreation facilities) and Cape Horn Dam Area (Cape Horn Dam, Van Arsdale Reservoir, Potter Valley Powerhouse, and associated Project facilities); and
2. Special-status plants that are known or may potentially occur in wetland and riparian habitats along the Eel River to the Pacific Ocean and/or the East Branch Russian River to Lake Mendocino.

Special-Status Plants in the FERC Project Boundary and Adjacent to Project Facilities

Table 3.3.4-2 lists the special-status plant species that are known to occur or may potentially occur within the FERC Project boundary or adjacent to Project facilities based on (1) surveys completed within the FERC boundary and near Project facilities in 2018 and (2) a query of database records within 5 mi. of the FERC Project boundary (CNDDB 2024).

As described in Section 3.3.4.3 above, several large-scale fires (the 2017 Redwood Valley Fire, the 2018 Ranch Fire, and the 2020 August Complex Fire) have affected vegetation communities in the Project vicinity and may have affected special-status plant populations within the fire boundaries. The botanical survey data collected for the Project predate the 2018 Ranch and 2020 August Complex fires.

There are four special-status plant species that are known to occur in the FERC Project boundary or are adjacent to Project facilities, including the following:

- Two populations of three-fingered morning glory (*Calystegia collina* ssp. *tridactylosa*) (CRPR 1B.2), including the following:
  - One population located along the tunnel between Cape Horn Dam and the Potter Valley Powerhouse; and
  - One population located along the southern shoreline of Lake Pillsbury.
- One population of Greene's narrow-leaved daisy (*Erigeron greenei*) (CRPR 1B.2) located on the southeast shoreline of Lake Pillsbury;

[1] Confidential maps are provided in Volume III.

- Eleven populations of glandular western flax (*Hesperolinon adenophyllum*) (CRPR 1B.2), including the following:
  - Five populations near the Potter Valley Powerhouse and Cape Horn Dam areas;
  - Six populations in the vicinity of Scott Dam and around the shoreline of Lake Pillsbury; and
- One population of grooved beard lichen (*Sulcaria badia*) (USFS, CRPR 4.2) near the Eel River Visitor Information Kiosk.

Twenty-two special-status plant species have the potential to occur in the FERC Project boundary or adjacent to Project facilities based on the geographic location and elevation of the Project and the vegetation alliances present in the study area.

Special-Status Plants Known or Potentially Occurring in Riparian and Wetland Habitats Downstream of Project Dams

Table 3.3.4-3 lists riparian- or wetland-associated special-status plant species with potential to occur in the East Branch Russian River, Eel River, or Eel River estuary, which are downstream of the Project dams.

Nine special-status species have recorded occurrences in riparian and wetland habitats along the East Branch Russian River, Eel River, or Eel River estuary downstream of Project dams, including the following federally listed species:

- Two occurrences of western lily (*Lilium occidentale*) (FE, CE, CRPR 1B.1) in the Eel River estuary.

Based on the geographic location and elevation of the Project, eight special-status species may potentially occur in riparian and wetland habitats in the study area.

This Page Intentionally Left Blank

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of special-status biological resources and qualify as Confidential Information (18 CFR § 385.1112). Disclosure of such information could be harmful to these resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.4-2a-i. CONFIDENTIAL special-status plants known to occur in the study area.

The maps identified above are included in Volume III, Exhibit E Privileged Information—Biological Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Table 3.3.4-2. Special-status plants known or potentially occurring in the FERC Project boundary or adjacent to Project facilities.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
KNOWN TO OCCUR IN THE FERC PROJECT BOUNDARY OR ADJACENT TO PROJECT FACILITIES									
Calystegia collina ssp. *tridactylosa*	three-fingered morning glory	– / – / – / 1B.2	2018 Botanical Survey, CNPS, CNDDB	perennial rhizomatous herb	APR–JUN	0–600	Serpentinite, rocky, or gravelly soils along openings in chaparral and cismontane woodland	**Known to occur.** • One population was detected in this portion of the study area during 2018 botanical surveys (PG&E 2019). One population was identified along the southeast shore of Lake Pillsbury during 2018 botanical surveys (PG&E 2019).	**Known to occur.** • One population was detected during 2018 botanical surveys (PG&E 2019). One population is between Cape Horn Dam and the Potter Valley Powerhouse.
Erigeron greenei	Greene's narrow-leaved daisy	– / – / – / 1B.2	2018 Botanical Survey	perennial herb	MAY–SEP	80–1,005	Serpentinite and volcanic soils in chaparral	**Known to occur.** • One population was identified along the southeast shore of Lake Pillsbury during 2018 botanical surveys (PG&E 2019). •	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys (PG&E 2019).
Hesperolinon adenophyllum	glandular western flax	– / – / – / 1B.2	CNPS, CNDDB	annual herb	MAY–AUG	150–1,315	Usually serpentinite soils in chaparral, cismontane woodland, and valley and foothill grassland	**Known to occur.** • Five populations were identified between the Potter Valley Powerhouse and Cape Horn Dam during 2018 botanical surveys (PG&E 2019), and six populations were identified in the vicinity of Scott Dam and Lake Pillsbury. • There are six additional CNDDB occurrences within a 1-mi. buffer of the FERC Project boundary.	**Known to occur.** • Six populations were identified in the vicinity of Scott Dam and Lake Pillsbury during 2018 botanical surveys (PG&E 2019). • There are six additional CNDDB occurrences within a 1-mi. buffer of the FERC Project boundary.
Sulcaria badia	grooved beard lichen	– / – / USFS / 4.2	2018 botanical surveys, CNPS, USFS	fruticose lichen (epiphytic)	N/A	415–1,510	Usually on bark of hardwoods and conifers in cismontane woodland and lower montane coniferous forest	**Known to occur.** • One population observed near the Eel River Visitor Information Kiosk during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys (PG&E 2019).

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
MAY POTENTIALLY OCCUR IN THE FERC PROJECT BOUNDARY OR ADJACENT TO PROJECT FACILITIES									
Antirrhinum subcordatum	dimorphic snapdragon	– / – / USFS / 4.3	CNPS, CNDDB	annual herb	APR–JUL	185–800	Sometimes serpentinite soils in chaparral and lower montane coniferous forest	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys (PG&E 2019).	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys (PG&E 2019).
Arctostaphylos manzanita ssp. *elegans*	Konocti manzanita	– / – / – / 1B.3	CNPS, CNDDB	perennial evergreen shrub	(JAN) MAR–MAY (JUL)	395–1,615	Volcanic soils in chaparral, cismontane woodland, and lower montane coniferous forest	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Balsamorhiza macrolepis var. *macrolepis* (= *B. macrolepis*)	big-scale balsamroot	– / – / USFS / 1B.2	CNPS, USFS	perennial herb	MAR–JUN	45–1,555	Chaparral, cismontane woodland, valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Brodiaea coronaria ssp. *rosea* (= *B. rosea*)	Indian Valley brodiaea	– / CE / USFS / 3.1	CNPS, CNDDB, USFS	perennial bulbiferous herb	MAY–JUN	335–1,450	Closed-cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
Calycadenia micrantha	small-flowered calycadenia	– / – / USFS / 1B.2	CNPS, CNDDB, USFS	annual herb	JUN–SEP	5–1,500	In sparsely vegetated areas with exposed rock, talus, or scree, and sometimes serpentinite soils, in chaparral, volcanic areas of meadows and seeps, and roadsides in valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Cuscuta jepsonii	Jepson's dodder	– / – / – / 1B.2	CNPS, CNDDB	annual vine (parasitic)	JUL–SEP	1,200–2,300	Streambanks in North Coast coniferous forest	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Cypripedium fasciculatum	clustered lady's-slipper	– / – / USFS / 4.2	USFS	perennial rhizomatous herb	MAR–AUG	100–2,435	Usually serpentinite seeps and streambanks, lower montane coniferous forest, and North Coast coniferous forest	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Cypripedium montanum	mountain lady's-slipper	– / – / USFS / 4.2	CNPS, USFS	perennial rhizomatous herb	MAR–AUG	185–2,225	Broad-leaved upland forest, cismontane woodland, lower montane coniferous forest, and North Coast coniferous forest	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Eriastrum tracyi	Tracy's eriastrum	– / CR / – / 3.2	CNPS, CNDDB	annual herb	MAY–JUL	315–1,780	Chaparral, cismontane woodland, valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
Eriogonum nervulosum	Snow Mountain buckwheat	– / – / USFS / 1B.2	CNPS, CNDDB, USFS	perennial rhizomatous herb	JUN–SEP	300–2,105	Serpentine soils in chaparral	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Eriogonum tripodum	tripod buckwheat	– / – / USFS/ 4.2	CNPS, USFS	perennial deciduous shrub	MAY–JUL	655–5,250	Chaparral, cismontane woodland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Fritillaria roderickii	Roderick's fritillary	– / CE / – / 1B.1	CNPS, CNDDB	perennial bulbiferous herb	MAR–MAY	15–400	Coastal bluff scrub, coastal prairie, valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Grimmia torenii	Toren's grimmia	– / – / – / 1B.3	CNPS, CNDDB	moss	N/A	325–1,160	Openings, rocky, boulder and rock walls, carbonate, volcanic areas in chaparral, cismontane woodland, and lower montane coniferous forest	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Harmonia stebbinsii	Stebbins' harmonia	– / – / USFS / 1B.2	CNPS, CNDDB	annual herb	MAY–JUN	400–1,580	Serpentinite soils in chaparral and lower montane coniferous forest	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
Hesperolinon drymarioides	Lake County (drymaria-like) western flax	– / – / USFS / 1B.2	CNPS, CNDDB	annual herb	MAY–AUG	100–1,130	Serpentinite soils in closed-cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Limnanthes bakeri	Baker's meadowfoam	– / CR / – / 1B.1	CNPS, CNDDB	annual herb	APR–MAY	175–910	Meadows and seeps, freshwater marshes and swamps, vernally mesic valley and foothill grassland, and vernal pools	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Lupinus milo-bakeri	Milo Baker's lupine	– / CT / – / 1B.1	CNPS, CNDDB	annual herb	JUN–SEP	395–430	Often along roadsides in cismontane woodland and valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Mielichhoferia elongata	elongate copper moss	– / – / USFS / 4.3	CNPS, CNDDB, USFS	moss	N/A	0–6,430	Acidic soils in broadleaf upland forest, chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, subalpine coniferous forest	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Sidalcea hickmanii ssp. *pillsburiensis*	Lake Pillsbury checkerbloom	– / – / USFS / 1B.2	CNPS, CNDDB	perennial herb	JUL–AUG	700–700	Openings in chaparral with Franciscan soils	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
Sidalcea oregana ssp. *hydrophila*	marsh checkerbloom	– / – / – / 1B.2	CNPS, CNDDB	perennial herb	(JUN) JUL–AUG	1,100–2,300	Meadows and seeps and mesic areas of riparian forest	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • There is one CNDDB occurrence within 1 mi. of the FERC Project boundary (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Tracyina rostrata	beaked tracyina	– / – / USFS / 1B.2	CNPS, CNDDB	annual herb	MAY–JUN	295–1,270	Cismontane woodland and valley and foothill grassland	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Tricholomopsis fulvescens	tawny tricholomopsis	– / – / USFS / –	USFS	fungus	N/A	>1,000	Found solitary on decayed conifer wood	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**May potentially occur.** • This portion of the study area contains suitable habitat and lies within the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
UNLIKELY TO OCCUR									
Lasthenia conjugens	Contra Costa goldfields	FE/ – / – / 1B.1	CNPS, CNDDB	annual herb	MAY–JUL	0–470	Cismontane woodland, playas, valley and foothill grassland, and vernal pools	**Unlikely to occur.** • While this portion of the study area is within the historical range of this species, there are no recent records. The closest known occurrences are located in southern Napa and Sonoma counties. • USFWS has designated critical habitat for this species; however, there is no critical habitat in this portion of the study area.	**Unlikely to occur.** While this portion of the study area is within the historical range of this species, there are no recent records. The closest known occurrences are located in southern Napa and Sonoma counties. • USFWS has designated critical habitat for this species; however, there is no critical habitat in this portion of the study area.
Lewisia stebbinsii	Stebbins' lewisia	– / – / USFS / 1B.2	CNPS, CNDDB, USFS	perennial herb	MAY–JUL	1,600–2,050	Gravelly, sometimes serpentinite soils in lower montane coniferous forest and upper montane coniferous forest	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Lupinus antoninus	Anthony Peak lupine	– / – / USFS / 1B.2	CNPS, CNDDB, USFS	perennial herb	MAY–JUL	1,220–2,285	Rocky areas in lower montane coniferous forest and upper montane coniferous forest	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Lupinus constancei	Lassics lupine	FE / CE / – / 1B.1	USFS	perennial herb	JUL	1,700–1,800	Serpentinite soils in lower montane coniferous forest in the Lassics Mountains	**Unlikely to occur.** • While this portion of the study area is within the historical range of this species, there are no recent records. The closest known occurrences are located near Mount Lassic in Humboldt and Trinity counties. USFWS has designated critical habitat for this species; however, there is no critical habitat in this portion of the study area.	**Unlikely to occur.** • While this portion of the study area is within the historical range of this species, there are no recent records. The closest known occurrences are located near Mount Lassic in Humboldt and Trinity counties. • USFWS has designated critical habitat for this species; however, there is no critical habitat in this portion of the study area.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
Ophioglossum pusillum	northern adder's-tongue	– / – / USFS / 2B.2	CNPS, CNDDB, USFS	perennial rhizomatous herb	JUL	1,000–2,000	Margins of meadows and seeps, marshes, and swamps	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Peltigera gowardii (= *Hydrothyria venosa*)	veined water lichen	– / – / USFS / 4.2	CNPS, CNDDB, USFS	foliose lichen (aquatic)	N/A	1,065–2,620	On rocks in cold water creeks with little or no sediment or disturbance in riparian forest	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species. • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Plagiobothrys lithocaryus	Mayacamas popcornflower	– / – / – / 1A	CNPS, CNDDB	annual herb	APR–MAY	300–450	Mesic areas in chaparral, cismontane woodland, and valley and foothill grassland	**Unlikely to occur.** • This species is presumed extinct/extirpated by CNPS. • There is one historical CNDDB occurrence within 1 mi. of the FERC Project boundary from 1899 (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**Unlikely to occur.** • This species is presumed extinct/extirpated by CNPS. • There is one historical CNDDB occurrence within 1 mi. of the FERC Project boundary from 1899 (CNDDB 2024). • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.
Ptilidium californicum	Pacific fuzz wort	– / – / USFS / 4.3	CNPS, CNDDB, USFS	liverwort	N/A	1,140–1,800	Usually epiphytic on trees, fallen and decaying logs, and stumps and rarely on humus over boulders in lower montane coniferous forest and upper montane coniferous forest	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species • Not observed in the FERC Project boundary or adjacent to Project facilities during 2018 botanical surveys.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)
Sidalcea keckii	Keck's checkerbloom	FE/ – / – / 1B.1	CNPS, CNDDB	annual herb	APR–MAY (JUN)	75–650	Cismontane woodland and valley and foothill grassland	**Unlikely to occur.** • This portion of the study area is outside of the current range of the species. The closest known occurrences are located in western Colusa County. • USFWS has designated critical habitat for this species; however, there is no critical habitat in this portion of the study area.	**Unlikely to occur.** • While this portion of the study area is within the historical range of this species, there are no recent records. The closest known occurrences are located in western Colusa County. • USFWS has designated critical habitat for this species; however, there is no critical habitat in this portion of the study area.
Trifolium amoenum	showy Indian (= two-fork) clover	FE / – / – / 1B.1	USFWS, CNPS, CNDDB	annual herb	APR–JUN	4–415	Coastal bluff scrub and sometimes serpentinite areas in valley and foothill grassland	**Unlikely to occur.** • This portion of the study area is outside of the current range of the species. The closest known occurrences are located in southern Napa and Sonoma counties. • USFWS has not designated critical habitat for this species.	**Unlikely to occur.** • While this portion of the study area is within the historical range of this species, there are no recent records. The closest known occurrences are located in southern Napa and Sonoma counties. • USFWS has not designated critical habitat for this species.

Note: The Project vicinity for special-status species plants includes areas within 5 mi. of the FERC Project boundary or river reaches potentially affected by decommissioning activities (the Eel River between Scott Dam and Van Arsdale Reservoir, the Eel River between Cape Horn Dam and the Middle Fork Eel River confluence, and the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino).

[1.] CNPS (2024) or Baldwin et al. (2012) unless otherwise noted.

Federal

FC Federal species of concern
FE Federally endangered
FT Federally listed as threatened
FDR Federally delisted (recovered)
FPE Federally proposed endangered
– No federal status

State

CE State-listed as endangered
CR State-listed as rare
CT State threatened
– No state status

USFS

USFS USFS Sensitive or Watch List

CRPR Threat Ranks

0.1 Seriously threatened in California (high degree/immediacy of threat)
0.2 Fairly threatened in California (moderate degree/immediacy of threat)
0.3 Not very threatened in California (low degree/immediacy of threats or no current threats known)

California Rare Plant Rank

1B Plants rare, threatened, or endangered in California and elsewhere
2B Plants rare, threatened, or endangered in California but more common elsewhere
3 More information needed about this plant, a review list
4 Plants of limited distribution, a watch list
CBR Considered but rejected

This Page Intentionally Left Blank

Table 3.3.4-3. Special-status plants potentially occurring in riparian or wetland habitats along the Eel River to the Pacific Ocean or East Branch Russian River to Lake Mendocino.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Eel River to the Pacific Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
KNOWN TO OCCUR IN RIPARIAN AND WETLAND HABITATS									
Carex lyngbyei	Lyngbye's sedge	– / – / – / 2B.2	CNDDB, CNPS	perennial rhizomatous herb	APR–AUG	0–10	Upper edges of tidal marshes, along tidal flats and river mouths with active sedimentation in silty, clayey, or mucky soils	**Known to occur.** • There are 12 CNDDB occurrences within this portion of the study area in the Eel River estuary (CNDDB 2024).	**Unlikely to occur.** • This portion of the study area is outside the geographic range for this species.
Castilleja ambigua ssp. *humboldtiensis*	Humboldt Bay owl's-clover	– / – / – / 1B.1	CNDDB, CNPS	annual herb (hemiparasitic)	APR–AUG	0–10	Grows at sea level in coastal salt marshes and swamps	**Known to occur.** • There are four CNDDB occurrences within this portion of the study area in the Eel River estuary (CNDDB 2024).	**Unlikely to occur.** • This portion of the study area is outside the geographic range for this species.
Chloropyron maritimum ssp. *palustre*	Point Reyes salty bird's-beak	– / – / – / 1B.2	CNDDB, CNPS	annual herb	JUN–OCT	0–10	Coastal salt marshes and swamps	**Known to occur.** • There is one CNDDB occurrence within this portion of the study area in the Eel River estuary (CNDDB 2024).	**Unlikely to occur.** • This portion of the study area is outside the geographic range for this species.
Fissidens pauperculus	minute pocket moss	– / – / – / 1B.2	CNPS, CNDDB	moss	N/A	10–1,024	Damp coastal soils in North Coast coniferous forest	**Known to occur.** • There is one CNDDB occurrence within this portion of the study area along the Eel River (CNDDB 2024).	**Unlikely to occur.** • This portion of the study area does not contain suitable habitat for this species.
Lilium occidentale	western lily	FE / CE / – / 1B.1	CNDDB	perennial herb (bulb)	JUN–JUL	1–184	Bogs and fens, coastal bluff scrub, coastal prairie, freshwater marshes and swamps, and North Coast coniferous forests at sites that receive water from subsurface flows and soils high in organic matter. *USFWS has not designated critical habitat for this species.*	**Known to occur.** • There are two CNDDB occurrences in the Eel River estuary (CNDDB 2024).	**Unlikely to occur.** • This portion of the study area is outside the geographic range for this species.
Montia howellii	Howell's montia	– / – / – / 2B.2	CNPS, CNDDB	annual herb	MAR–MAY	0–835	North Coast coniferous forests, meadows, seeps, and vernal pools	**Known to occur.** • There is one CNDDB occurrence along the Eel River and its tributary drainages (CNDDB 2024).	**May potentially occur.** • This portion of the study area contains suitable habitat for this species.
Puccinellia pumila	dwarf alkali grass	– / – / – / 2B.1	CNPS, CNDDB	perennial grasslike herb	JUL	1–10	Coastal salt marshes and swamps	**Known to occur.** • There is one CNDDB occurrence in the Eel River estuary (CNDDB 2024).	**Unlikely to occur.** • This portion of the study area is outside the geographic range for this species.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Eel River to the Pacific Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Silene bolanderi	Bolander's catchfly	– / – / – / 1B.2	CNPS, CNDDB	perennial herb	MAY–JUN	420–1,150	Chaparral (edges), cismontane woodland, lower montane coniferous forest, meadows and seeps, North Coast coniferous forest	**May potentially occur.** • This species may be present in suitable habitat along the Eel River.	**Known to occur.** • There is one CNDDB occurrence south of the Potter Valley Powerhouse, along the Eel River. • This species may be present in suitable habitat along the East Branch Russian River.
MAY POTENTIALLY OCCUR IN RIPARIAN AND WETLAND HABITATS									
Calycadenia micrantha	small-flowered calycadenia	– / – / USFS / 1B.2	CNPS, CNDDB, USFS	annual herb	JUN–SEP	5–1,500	In sparsely vegetated areas with exposed rock, talus, or scree and sometimes serpentinite soils in chaparral, volcanic areas of meadows and seeps, and roadsides in valley and foothill grassland	**May potentially occur.** • This species may be present in suitable habitat along the Eel River.	**May potentially occur.** • This species may be present in suitable habitat along the East Branch Russian River.
Cypripedium fasciculatum	clustered lady's-slipper	– / – / USFS / 4.2	USFS	perennial rhizomatous herb	MAR–AUG	100–2,435	Usually serpentinite seeps and streambanks, lower montane coniferous forest, and North Coast coniferous forest	**May potentially occur.** • This species may be present in suitable habitat along the Eel River.	**May potentially occur.** • This species may be present in suitable habitat along the East Branch Russian River.
Erysimum menziesii	Menzies' wallflower	FE / CE / – / 1B.1	CNDDB, CNPS	perennial herb	MAR–SEP	0–35	Sand dunes of coastal bars, river mouths, and spits along the immediate coastline *USFWS has not designated critical habitat for this species.*	**May potentially occur.** • This species may be present in suitable habitat within the Eel River estuary.	**Unlikely to occur.** • This portion of the study area is outside the geographic range of this species.
Lasthenia burkei	Burke's goldfields	FE / CE / – / 1B.1	CNPS, CNDDB, USFWS	annual herb	APR–JUN	15–600	Mesic meadows and seeps, vernal pools	**Unlikely to occur.** • This portion of the study area is outside the geographic range for this species.	**May potentially occur.** • This portion of the study area contains suitable habitat for this species.
Layia carnosa	beach layia	FT / CE / – / 1B.1	CNDDB	annual herb	MAR–JUL	0–60	Sand dunes of coastal bars, river mouths, and spits along the immediate coastline *USFWS has not designated critical habitat for this species.*	**May potentially occur** • This species may be present in suitable habitat within the Eel River estuary.	**Unlikely to occur.** • This portion of the study area is outside the geographic range of this species.
Limnanthes bakeri	Baker's meadowfoam	– / CR / – / 1B.1	CNPS, CNDDB	annual herb	APR–MAY	175–910	Meadows and seeps, freshwater marshes and swamps, vernally mesic valley and foothill grassland, and vernal pools	**May potentially occur.** • This species may be present in suitable habitat along the Eel River.	**May potentially occur.** • This species may be present in suitable habitat along the East Branch Russian River.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Eel River to the Pacific Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Mielichhoferia elongata	elongate copper moss	– / – / USFS / 4.3	CNPS, CNDDB, USFS	moss	N/A	0–6,430	Acidic soils in broadleaf upland forest, chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, subalpine coniferous forest	**May potentially occur.** • This species may be present in suitable habitat along the Eel River.	**May potentially occur.** • This species may be present in suitable habitat along the East Branch Russian River.
Pleuropogon hooverianus	North Coast semaphore grass	– / CT / – / 1B.1	CNPS, CNDDB	perennial rhizomatous herb	APR–JUN	10–671	Open areas and mesic soils in broad-leaved upland forest, meadows and seeps, and North Coast coniferous forest	**May potentially occur.** • This species may be present in suitable habitat along the Eel River.	**May potentially occur.** • This species may be present in suitable habitat along the East Branch Russian River.
UNLIKELY TO OCCUR IN RIPARIAN AND WETLAND HABITATS									
Botrychium virginianum (= *Botrypus virginianus*)	rattlesnake fern	– / – / USFS / 2B.2	USFS	perennial herb	JUN–SEP	715–1,355	Streams, bogs, fens, mesic lower montane coniferous forest, meadows and seeps, and riparian forest	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species
Clarkia amoena ssp. *whitneyi*	Whitney's farewell-to-spring	– / – / – / 1B.1	CNPS, CNDDB	annual herb	JUN–AUG	10–100	Coastal bluff scrub and coastal scrub	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There is one CNDDB occurrence within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.
Downingia willamettensis	Cascade downingia	– / – / – / 2B.2	CNPS	annual herb	JUN–JUL (SEP)	50–3,640	Cismontane woodland (lake margins), valley and foothill grassland (lake margins), and vernal pools	**Unlikely to occur** • This species does not occur in riverine habitats. • There is one CNDDB occurrence within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riverine riparian habitats.
Gilia capitata ssp. *pacifica*	Pacific gilia	– / – / – / 1B.2	CNPS, CNDDB	annual herb	APR–AUG	5–1,665	Coastal bluff scrub, openings in chaparral, coastal prairie, and valley and foothill grassland	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There are two CNDDB occurrences within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.
Hesperevax sparsiflora var. *breviflora*	short-leaved evax	– / – / – / 1B.2	CNPS, CNDDB	annual herb	MAR–JUN	0–215	Sandy coastal bluff scrub, coastal dunes and prairies with shallow loam and clay soils, especially on volcanic and serpentinite substrates	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There are four CNDDB occurrences within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Eel River to the Pacific Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Hesperolinon adenophyllum	glandular western flax	– / – / – / 1B.2	CNPS, CNDDB	annual herb	MAY–AUG	150–1,315	Usually serpentinite soils in chaparral, cismontane woodland, and valley and foothill grassland	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There are two CNDDB occurrences within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats.
Horkelia tenuiloba	thin-lobed horkelia	– / – / – / 1B.2	CNPS	perennial herb	MAY–JUL (AUG)	50–500	Mesic opening with sandy soils in broadleafed upland forest, chaparral, and valley and foothill grassland	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • There is one CNDDB occurrence within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats.
Howellia aquatilis	water howellia	FD / – / USFS / 2B.2	USFWS, USFS, CNDDB	annual herb	JUN	1,085–1,290	Freshwater marshes and swamps	**Unlikely to occur.** • This portion of the study area is outside of the elevation range of this species	**Unlikely to occur.** • This portion of the study area is outside of the elevation range of this species
Ophioglossum pusillum	northern adder's-tongue	– / – / USFS / 2B.2	CNPS, CNDDB, USFS	perennial rhizomatous herb	JUL	1,000–2,000	Margins of meadows and seeps, marshes, and swamps	**Unlikely to occur.** • This portion of the study area is outside of the elevation range of this species	**Unlikely to occur.** • This portion of the study area is outside of the elevation range of this species
Packera bolanderi var. *bolanderi*	seacoast ragwort	– / – / – / 2B.2	CNPS, CNDDB	perennial herb	MAY–JUL	30–650	North Coast coniferous forests and coastal scrub	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There are eight CNDDB occurrences within 1 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.
Peltigera gowardii (= *Hydrothyria venosa*)	veined water lichen	– / – / USFS / 4.2	CNPS, CNDDB, USFS	foliose lichen (aquatic)	N/A	1,065–2,620	On rocks in cold water creeks with little or no sediment or disturbance in riparian forest	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species	**Unlikely to occur.** • This portion of the study area is outside of the geographic range of this species
Piperia candida	white-flowered rein orchid	– / – / – / 1B.2	CNPS, CNDDB	Perennial herb	(MAR, APR) MAY–SEP	30–1,310	Sometimes serpentinite soils in broad-leaved upland forest, lower montane coniferous forest, and North Coast coniferous forest	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There is one CNDDB occurrence within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.
Polemonium carneum	Oregon polemonium	– / – / – / 2B.2	CNPS, CNDDB	perennial herb	APR–SEP	0–1,830	Coastal prairies, coastal scrub, and lower montane coniferous forests	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There is one CNDDB occurrence within 0.25 mi. of the Eel River.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.

Scientific Name	Common Name	Status (Federal / State / USFS / CRPR)	Query Source	Lifeform[1]	Bloom Period[1]	Elevation Range (m)[1]	Habitat Associations[1]	Potential for Occurrence (Eel River to the Pacific Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Sidalcea malviflora ssp. *patula*	Siskiyou checkerbloom	– / – / – / 1B.2	CNPS, CNDDB	perennial rhizomatous herb	MAY–AUG	0–1,230	Coastal bluff scrub, coastal prairie, North Coast coniferous forest	**Unlikely to occur** • This species does not occur in riparian or wetland habitats. • There is one CNDDB occurrence within 0.25 mi. of the Eel River estuary.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats. • This portion of the study area is outside the geographic range of this species.
Tracyina rostrata	beaked tracyina	– / – / USFS / 1B.2	CNPS, CNDDB	annual herb	MAY–JUN	295–1,270	Cismontane woodland and valley and foothill grassland	**Unlikely to occur** • This species does not occur in riparian or wetland habitats.	**Unlikely to occur.** • This species does not occur in riparian or wetland habitats.

Note: The Project vicinity for special-status species plants includes areas within 5 mi. of the FERC Project boundary or river reaches potentially affected by decommissioning activities (the Eel River between Scott Dam and Van Arsdale Reservoir, the Eel River between Cape Horn Dam and the Middle Fork Eel River confluence, and the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino).

1. CNPS (2024) and Baldwin et al. (2012) unless otherwise noted.

Federal

FC Federal species of concern
FE Federally endangered
FT Federally listed as threatened
FDR Federally delisted (recovered)
FPE Federally proposed endangered
– No federal status

State

CE State-listed as endangered
CR State-listed as rare
CT State threatened
– No state status

USFS

USFS USFS Sensitive or Watch List

CRPR Threat Ranks

0.1 Seriously threatened in California (high degree/immediacy of threat)
0.2 Fairly threatened in California (moderate degree/immediacy of threat)
0.3 Not very threatened in California (low degree/immediacy of threats or no current threats known)

California Rare Plant Rank

1B Plants rare, threatened, or endangered in California and elsewhere
2B Plants rare, threatened, or endangered in California but more common elsewhere
3 More information needed about this plant, a review list
4 Plants of limited distribution, a watch list
CBR Considered but rejected

This Page Intentionally Left Blank

Invasive Weeds

Invasive weeds are defined as noxious by state and federal regulations and classified by the MNF and California Invasive Plant Council (Cal-IPC 2024). The study area for invasive weeds includes areas within the FERC Project boundary and areas adjacent to Project facilities.

Information on invasive weeds known to occur in the study area was obtained from inventory surveys conducted in the FERC Project boundary in 2018 (PG&E 2019). Information on invasive weeds potentially occurring in the study area was obtained from the California Invasive Plant Inventory (Cal-IPC 2024) and from the invasive plants database maintained by the MNF (USFS 2016c). Invasive weed ratings, their management within the study area, and a list of invasive weeds known to occur or potentially occurring in the study area are discussed below.

There are 15 invasive weed species previously documented in FERC Project boundary. Refer to Table 3.3.4-4 for a list of invasive weeds that are known to occur in the study area. Six species have the potential to occur within the study area. Refer to Table 3.3.4-5 for a list of invasive weeds that have potential to occur in the study area based on data layers received from the MNF (USFS 2016b). Invasive weed populations documented in the study area are shown on Map 3.3.4-3.

Note that the invasive weed data provided in this section pre-date several recent wildfires (i.e., 2017 Redwood Valley Fire, 2018 Ranch Fire, and 2020 August Complex Fire) that have burned in the study area. In California, native vegetation communities are particularly susceptible to colonization from invasive weeds after fires (Keeley et al. 2011). Therefore, it is possible that invasive weeds have become more prevalent in the study area since the time of the fires.

Table 3.3.4-4. Invasive weeds known to occur in the FERC Project boundary and adjacent to Project facilities.

Scientific Name[1]	Common Name	Cal-IPC / CDFA Ratings[2]	Habitat	Known to Occur in Scott Dam Area?	Known to Occur in Cape Horn Dam Area?
Arundo donax	giant reed	High / CCR 4500 List	Grows primarily in grasslands, forests, plantations, orchards, irrigation channels, coastal dunes, roadsides, and along rivers and streams. Also found in wetlands.	Yes	No
Bromus diandrus	ripgut brome	Moderate / –	Disturbed areas throughout the state, grasslands, open sites, roadsides, fields, rangelands, orchards, agronomic crops fields, forestry sites, and many natural plant communities.	No	Yes
Bromus tectorum	cheat grass	High / C	Disturbed areas throughout the state and will grow in any type of soil. Quick to colonize into surrounding undisturbed areas.	Yes	Yes
Carduus pycnocephalus	Italian thistle	Moderate / CCR 4500 List	Disturbed areas, roadsides, and grasslands throughout the state.	Yes	Yes
Centaurea solstitialis	yellow star thistle	High / CCR 4500 List	Disturbed areas throughout the state. Most invasive in annual and perennial grasslands, shrub steppes, oak savannas, open woodlands, and openings in forests.	Yes	Yes
Cirsium arvense	Canada thistle	Moderate / CCR 4500 List	Found in disturbed and urban areas; along roadsides; in grasslands and cultivated areas; and in forests, plantations, and orchards. It can also be found along riverbanks.	Yes	No

Scientific Name[1]	Common Name	Cal-IPC / CDFA Ratings[2]	Habitat	Known to Occur in Scott Dam Area?	Known to Occur in Cape Horn Dam Area?
Cytisus scoparius	Scotch broom	High / CCR 4500 List	Found in redwood forests in clearcut zones, the Sierra foothills, oak woodlands, chaparral, ponderosa pine. It is also found in coastal and valley grasslands, along roadsides, and prairie with mixed annual grasses and forbs.	No	Yes
Elymus caput-medusae	medusa head	High / CCR 4500 List	Typically found in disturbed sites, grasslands, openings in chaparral, and oak woodlands.	Yes	No
Genista monspessulana	French broom	High / C & CCR 4500 List	Occurs in annual grasslands, oak woodlands, coastal scrub, chaparral, conifer, and relatively open mixed evergreen forests.	Yes	Yes
Hypericum perforatum	klamathweed	Limited / C & CCR 4500 List	Found in disturbed areas and occasionally in wetlands. Also found in open woods, meadows, grasslands, steppe, riverbanks, and stony or grassy hillsides and roadsides. It prefers dry habitats or areas with strong drainage.	Yes	Yes
Lepidium latifolium	perennial pepperweed	High / CCR 4500 List	Found in disturbed areas throughout the state and equally likely to occur in wetlands and non-wetlands. Also found in coastal beaches; dunes; meadows and fields; and intertidal, subtidal, or open ocean habitats.	No	Yes
Melilotus officinalis	yellow sweetclover	– / –	Found in disturbed sites, roadsides, grasslands, forest edges, hillsides, prairies, savannas, dunes, and ravine shores. It can also be found growing in pastures, farms, and agricultural lands.	Yes	No

Scientific Name[1]	Common Name	Cal-IPC / CDFA Ratings[2]	Habitat	Known to Occur in Scott Dam Area?	Known to Occur in Cape Horn Dam Area?
Rubus armeniacus	Himalayan blackberry	High / –	Found in wetland and riparian areas but also grows in upland areas. Most invasive in low-elevation riparian, hardwood, and conifer communities.	Yes	Yes
Tamarix parviflora	smallflower tamarisk	High / CCR 4500 List	Found mainly in riparian habitats along river floodplains, streams, and around lakes or reservoirs. Can also be found in forests, grasslands, disturbed areas, roadsides, and plantations or orchards.	Yes	No
Verbascum thapsus	common mullein	Limited / –	Found in disturbed areas throughout the state, roadsides, streambanks, and can occasionally be found in wetlands.	Yes	Yes

Notes: – = Not listed

1. This list includes species that were listed on the MNF target list of invasive weeds in 2018. This list was used to map invasive weed populations during surveys conducted in the FERC Project boundary in 2018 (PG&E 2019).
2. Ratings:

California Invasive Plant Council:
High = Severe ecological impacts, moderate to high rates of dispersal and establishment, and widely distributed.
Moderate (Mod) = Substantial and apparent ecological impacts; moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance.
Limited (Lim) = Invasive, but ecological impacts are minor; moderate rates of invasion; distribution generally limited.
Red Alert = Pest plants with the potential to spread explosively.

California Department of Food and Agriculture (CDFA) Lists (CDFA 2024):
A = The agency mandates that these species be targeted for eradication or containment.
B = These species are more widespread and, therefore, difficult to contain, and the agency allows County Agricultural Commissioners to decide whether to target them for eradication or containment in their jurisdictions.
C = These weeds are widespread, and the agency does not endorse state- or county-funded eradication or containment efforts except in nurseries or seed lots.
CCR 4500 List = Listed on California Code of Regulations, Section 4500 Noxious Weed List, as of June 22, 2021.

Table 3.3.4-5. Invasive weeds potentially occurring in the study area.

Scientific Name[1]	Common Name	Cal-IPC / CDFA Ratings[2]	Habitat
Arrhenatherum elatius	tall oatgrass	– / –	Occurs in disturbed, open sites.
Carduus tenuiflorus	Italian plumeless thistle	Limited / CCR 4500 List	Occurs on roadsides, pastures, and disturbed areas.
Cirsium vulgare	bull thistle	Moderate / CCR 4500 List	Occurs in coastal grasslands, along edges of fresh and brackish marshes, and in meadows and mesic forest openings in the mountains.
Senecio jacobaea	stinking willie	Limited / CCR 4500 List	Occurs in Northern California along disturbed places, roadsides, and waste sites.
Spartium junceum	Spanish broom	High / CCR 4500 List	Occurs throughout the western part of California.
Tamarix ramosissima	saltcedar	High / CCR 4500 List	Occurs along streams and lake shores throughout California.

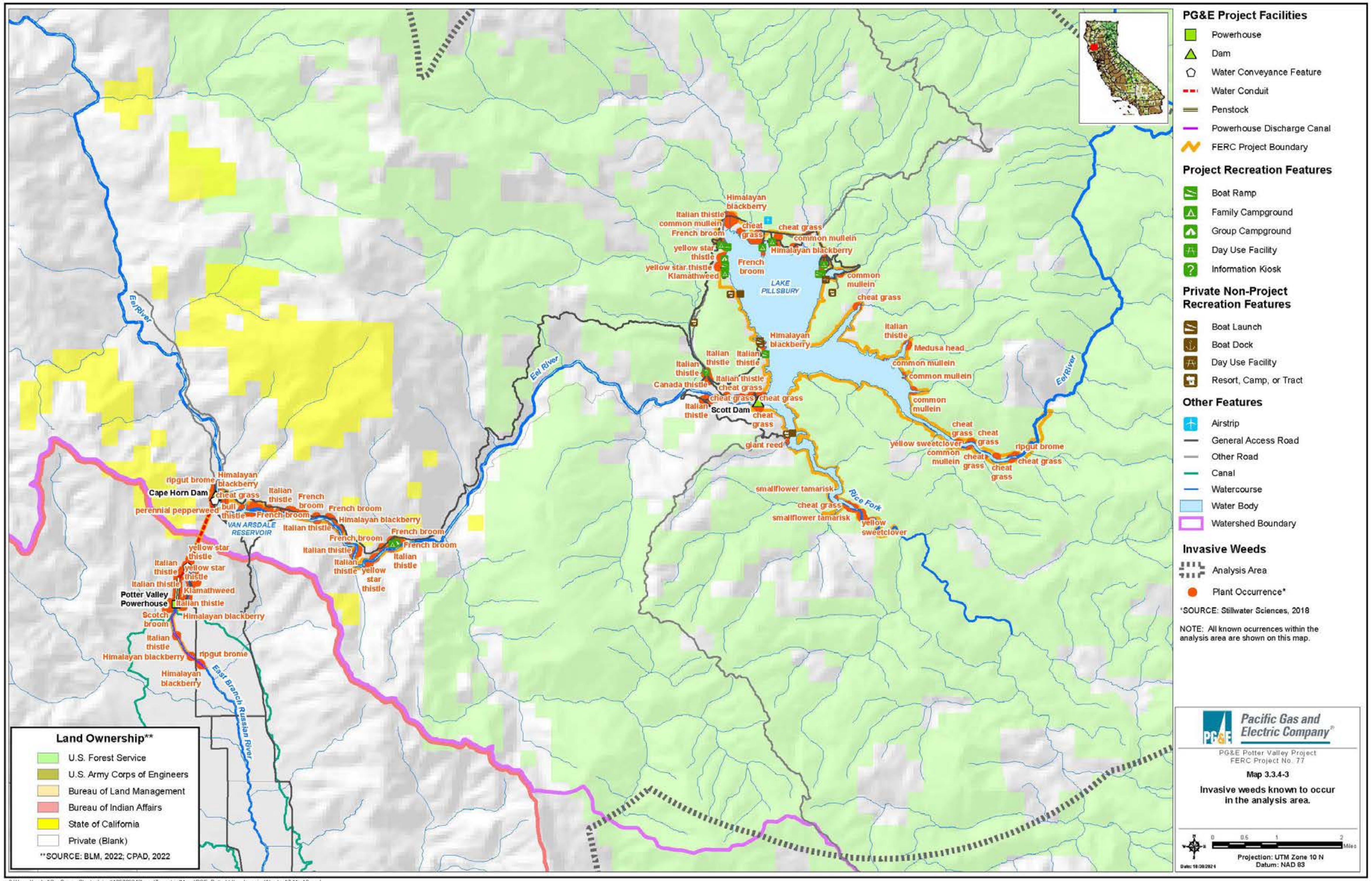
Notes: – = Not listed

1. This list includes species that were identified on MNF database layers from 2016 (USFS 2016b) within a 5-mi. buffer of the Project area.
2. Ratings:

California Invasive Plant Council:
High = Severe ecological impacts, moderate to high rates of dispersal and establishment, and widely distributed.
Moderate (Mod) = Substantial and apparent ecological impacts; moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance.
Limited (Lim) = Invasive, but ecological impacts are minor; moderate rates of invasion; distribution generally limited.
Red Alert = Pest plants with the potential to spread explosively.

CDFA Lists (CDFA 2024):
A = The agency mandates that these species be targeted for eradication or containment.
B = These species are more widespread and, therefore, difficult to contain, and the agency allows County Agricultural Commissioners to decide whether to target them for eradication or containment in their jurisdictions.
C = These weeds are widespread, and the agency does not endorse state- or county-funded eradication or containment efforts except in nurseries or seed lots.
CCR 4500 List = Listed on California Code of Regulations, Section 4500 Noxious Weed List, as of June 22, 2021.

This Page Intentionally Left Blank



Map 3.3.4-3 Non-native invasive plants known to occur in the study area.

This Page Intentionally Left Blank

3.3.4.4 Riparian and Wetland Resources

This section describes riparian and wetland resources associated with floodplains along Project-affected stream reaches and littoral zones associated with Project reservoirs (Lake Pillsbury and Van Arsdale Reservoir).

A floodplain is a relatively flat lowland adjacent to a river, underlain by unconsolidated alluvial deposits and subject to periodic inundation by the river. The littoral zone occurs in the near-shore areas of lakes/reservoirs where sunlight penetrates to the bottom of the water bodies such that aquatic plants are able to grow.

Wetland and riparian habitats may occur within the floodplain alongside a stream or within the littoral zone of a lake/reservoir. Hydrologic conditions (including water table elevations, the annual hydrograph, and overbanking flows/reservoir fluctuations) and soil types present define the location of wetland and riparian habitats within the floodplains/littoral zones. Wetlands are areas that are inundated or saturated by surface or groundwater at a sufficient frequency and duration to support vegetation that is adapted to these hydrologic and saturated soil conditions. Meadows are a type of wetland found in moist areas that are typically seasonally or temporarily flooded. Riparian habitat occurs in transitional areas between the aquatic and terrestrial landscapes regularly influenced by fresh water and normally extend from the edges of water bodies (e.g., streams, rivers, and lakes) to the edges of upland communities.

Where rivers meet the ocean, the low gradient of the river and tidal fluctuations typically form a system of brackish wetlands, with specially adapted plants and wildlife that can survive a range of salt conditions. These transitional areas are collectively referred to as an estuary.

The study area in this section is defined to include the full extent of wetland and riparian habitats associated with the floodplains along Project-affected stream reaches (including the East Branch Russian River and the Eel River below Lake Pillsbury to the Eel River estuary), the littoral zones associated with Project reservoirs (Lake Pillsbury and Van Arsdale Reservoir), and the Eel River estuary.

Existing information on floodplains, littoral zones, estuaries, and associated wetland and riparian habitats in the study area includes published reports associated with previous studies, GIS data, aerial imagery, and agency databases. The following sources were used to characterize wetland and riparian habitats in the study area:

- CALVEG data for the MNF, as updated by USFS in 2016 (USFS 2016a);
- USFWS National Wetlands Inventory (NWI) layers (USFWS 2024a); and
- Preliminary information on riparian and wetland habitats around Lake Pillsbury and Van Arsdale Reservoir, as described in the TERR 1 – Botanical Resources Data Memorialization, Technical Study Summary (PG&E 2019).

Each source of information on riparian and wetland habitats is described more fully in the sections below.

CALVEG Riparian and Wetland Alliances

As described in Table 3.3.4-1 above, the following CALVEG alliances with wetland and riparian habitat associations are present in the study area:

- Herbaceous Vegetation Alliances
  - Pickleweed–Cordgrass
  - Wet Meadows
- Shrub-Dominated Vegetation Alliances
  - Riparian Mixed Shrub
  - Willow (Shrub)
- Tree-Dominated Vegetation Alliances
  - Riparian Mixed Hardwood
  - White Alder
  - Fremont Cottonwood
  - Willow
  - Red Alder
  - Black Cottonwood
  - Willow–Alder
- Aquatic Features
  - River/Stream/Canal
  - Perennial Lake or Pond
  - Reservoir
  - Ocean
  - Intermittent Lake or Pond
  - High Water Line/Gravel/Sand Bar

Refer to Map 3.3.4-1a through Map 3.3.4-1i for the location of these habitats in the study area.

The predominant riparian and wetland vegetation at Lake Pillsbury, Van Arsdale Reservoir, and the Eel River between both Project dams includes Fremont cottonwood, riparian mixed hardwood, riparian mixed shrub, wet meadows, white alder, willow, willow (shrub), and willow–alder alliances (refer to Map 3.3.4-1b).

The predominant riparian and wetland vegetation along the Eel River downstream of Van Arsdale Reservoir includes black cottonwood, Fremont cottonwood, red alder, riparian mixed hardwood, riparian mixed shrub, wet meadows, white alder, willow, willow (shrub), and willow–alder alliances (refer to Map 3.3.4-1b through Map 3.3.4-1i).

No riparian or wetland vegetation beyond aquatic features (i.e., river/stream/canal) were identified along the East Branch Russian River.

The predominant riparian and wetland vegetation within the Eel River estuary includes willow, willow (shrub), and pickleweed–cordgrass alliances (refer to Map 3.3.4.-1i).

NWI Riparian and Wetland Alliances

A search of the NWI indicated 10 NWI classification types in the study area. Refer to Table 3.3.4-6 for a full description of wetlands identified from the NWI in the study area. Refer to Appendix 3.3.4-B for maps of NWI-wetlands mapped in the study area using the USFWS online wetlands mapper (USFWS 2024a).

The section of the study area from Lake Pillsbury to the Eel River above Van Arsdale Reservoir contains temporary flooded palustrine emergent wetlands. Van Arsdale Reservoir and the Eel River to the Eel River estuary contains seasonally flooded palustrine forested wetlands. The East Branch Russian River contains temporary and seasonally flooded palustrine forested wetlands and temporary flooded palustrine emergent wetlands. The Eel River estuary contains eight NWI wetland classifications, the highest diversity of wetland types in the study area; these wetland types include both palustrine and estuarine wetlands.

Preliminary Information from TERR 1 – Botanical Resources Data Memorialization, Technical Study Summary

Preliminary wetland mapping was conducted around Lake Pillsbury and Van Arsdale Reservoir using aerial imagery (PG&E 2019). Based on this preliminary mapping, Lake Pillsbury contains 32 adjacent wetlands, and Van Arsdale Reservoir contains 8 adjacent wetlands.

Refer to Figure 3.3.4-1 for the locations of preliminary wetlands mapped around Lake Pillsbury. Refer to Figure 3.3.4-2 for the locations of preliminary wetlands mapped around Van Arsdale Reservoir.

This Page Intentionally Left Blank

Table 3.3.4-6. NWI wetland classifications in the study area.

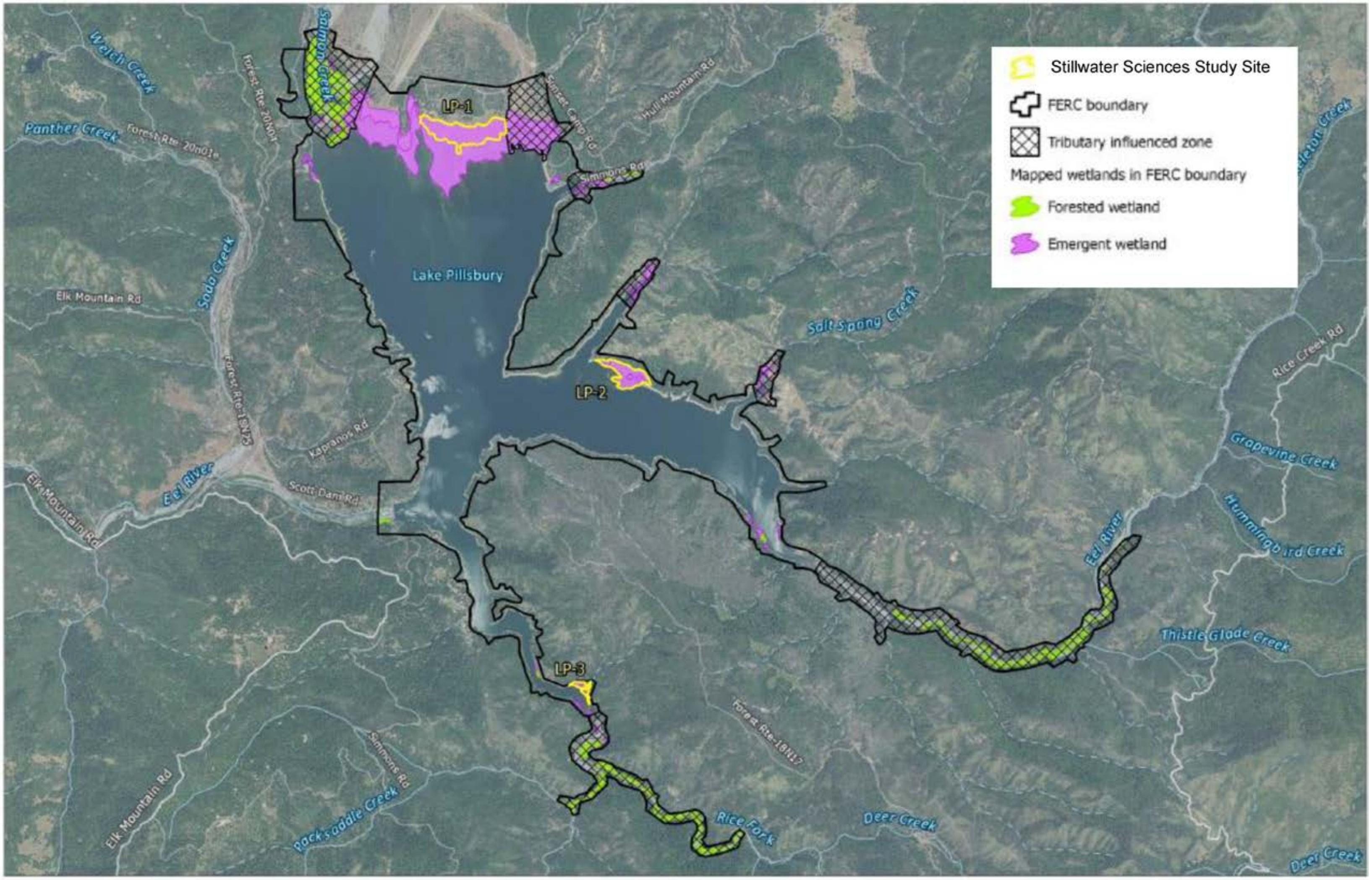
NWI Wetland Classification Code	NWI Wetland Description	Project-affected Reach			
		Lake Pillsbury and Eel River to Van Arsdale Reservoir	Van Arsdale Reservoir and Eel River to Eel River Estuary	East Branch Russian River	Eel River Estuary[1]
Palustrine Emergent Wetlands					
PEM1A	**Classification code: PEM1A** • System Palustrine (P): The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergent vegetation, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per trillion (ppt). It also includes wetlands lacking such vegetation but with all of the following four characteristics: (1) area less than 8 hectares (ha) (20 acres), (2) active wave-formed or bedrock shoreline features lacking, (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft.) at low water, and (4) salinity due to ocean-derived salts less than 0.5 ppt. • Class Emergent (EM): Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. • Subclass Persistent (1): Dominated by species that normally remain standing at least until the beginning of the next growing season. This subclass is found only in the Estuarine and Palustrine systems. • Water Regime Temporary Flooded (A): Surface water is present for brief periods (from a few days to a few weeks) during the growing season, but the water table usually lies well below the ground surface for most of the season.	X		X	
PEM1B	**Classification code: PEM1B** • System Palustrine (P): See definition of Palustrine above. • Class Emergent (EM): See definition of Emergent above. • Subclass Persistent (1): See definition of Persistent above. • Water Regime Seasonally Saturated (B): The substrate is saturated at or near the surface for extended periods during the growing season, but unsaturated conditions prevail by the end of the season in most years. Surface water is typically absent but may occur for a few days after heavy rain and upland runoff.				X
PEM1C	**Classification code: PEM1C** • System Palustrine (P): See definition of Palustrine above. • Class Emergent (EM): See definition of Emergent above. • Subclass Persistent (1): See definition of Persistent above. • Water Regime Seasonally Flooded (C): Surface water is present for extended periods, especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.				X

NWI Wetland Classification Code	NWI Wetland Description	Project-affected Reach			
		Lake Pillsbury and Eel River to Van Arsdale Reservoir	Van Arsdale Reservoir and Eel River to Eel River Estuary	East Branch Russian River	Eel River Estuary[1]
Palustrine Forested Wetlands					
PFO1A	**Classification code: PFO1A** • System Palustrine (P): See definition of Palustrine above. • Class Forested (FO): Characterized by woody vegetation that is 6 m tall or taller. • Subclass Broad-Leaved Deciduous (1): Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season, e.g., black ash (*Fraxinus nigra*). • Water Regime Temporary Flooded (A): See definition of Water Regime Temporary Flooded above.			X	X
PFO1C	**Classification code: PFO1C** • System Palustrine (P): See definition of Palustrine above. • Class Forested (FO): See definition of Forested above. • Subclass Broad-Leaved Deciduous (1): See definition of Broad-Leaved Deciduous above. • Water Regime Seasonally Flooded (C): See definition of Water Regime Seasonally Flooded above.			X	
PFOC	**Classification code: PFO1C** • System Palustrine (P): See definition of Palustrine above. • Class Forested (FO): See definition of Forested above. • Water Regime Seasonally Flooded (C): See definition of Water Regime Seasonally Flooded above.		X		
Palustrine Scrub-Shrub Wetlands					
PSS1C	**Classification code: PSS1C** • System Palustrine (P): See definition of Palustrine above. • Class Scrub-Shrub (SS): Includes areas dominated by woody vegetation less than 6 m (20 ft.) tall. The species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions. • Subclass Broad-Leaved Deciduous (1): See definition of Broad-Leaved Deciduous above. • Water Regime Seasonally Flooded (C): See definition of Water Regime Seasonally Flooded above.				X
Estuarine Wetlands					
E2AB3M	**Classification code: E2AB3M** • System Estuarine (E): The Estuarine System consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi closed by land but have open, partly obstructed, or sporadic access to the open ocean and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines, there is appreciable dilution of sea water. Offshore areas with typical estuarine plants and animals, such as red mangroves (*Rhizophora mangle*) and eastern oysters (*Crassostrea virginica*), are also included in the Estuarine System. • Subsystem Intertidal (2): The substrate in these habitats is flooded and exposed by tides; includes the associated splash zone. • Class Aquatic Bed (AB): Includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. • Subclass Rooted Vascular (3): Includes a large array of vascular species in the Marine and Estuarine systems. They are commonly referred to as grass flats. In the Riverine, Lacustrine, and Palustrine systems, these species occur at all depths in the photic zone. They often are in sheltered areas that have little water movement and can also be found in the flowing water of the Riverine System, where they may be streamlined or flattened in response to high water velocities. Some species are characterized by floating leaves. • Water Regime Irregularly Exposed (M): Tides expose the substrate less often than daily.				X

NWI Wetland Classification Code	NWI Wetland Description	Project-affected Reach			
		Lake Pillsbury and Eel River to Van Arsdale Reservoir	Van Arsdale Reservoir and Eel River to Eel River Estuary	East Branch Russian River	Eel River Estuary[1]
E2MEM1N	**Classification code: E2EM1N** System Estuarine (E): See definition of Estuarine above. Subsystem Intertidal (2): See definition of Intertidal above. Class Emergent (EM): See definition of Emergent above. Subclass Persistent (1): See definition of Persistent above. Water Regime Regularly Flooded (N): Tides alternately flood and expose the substrate at least once daily.				X
E2MEM1P	**Classification code: E2EM1P** System Estuarine (E): See definition of Estuarine above. Subsystem Intertidal (2): See definition of Intertidal above. Class Emergent (EM): See definition of Emergent above. Subclass Persistent (1): See definition of Persistent above. Water Regime Irregularly Flooded (P): Tides flood the substrate less often than daily.				X
E2SSIP	**Classification code: E2SS1P** System Estuarine (E): See definition of Estuarine above. Subsystem Intertidal (2): See definition of Intertidal above. Class Scrub-Shrub (SS): See definition of Scrub-Shrub above. Subclass Persistent (1): See definition of Persistent above. Water Regime Irregularly Flooded (P): See definition of Water Regime Irregularly Flooded above.				X
	TOTAL WETLAND TYPES	**1**	**1**	**3**	**8**

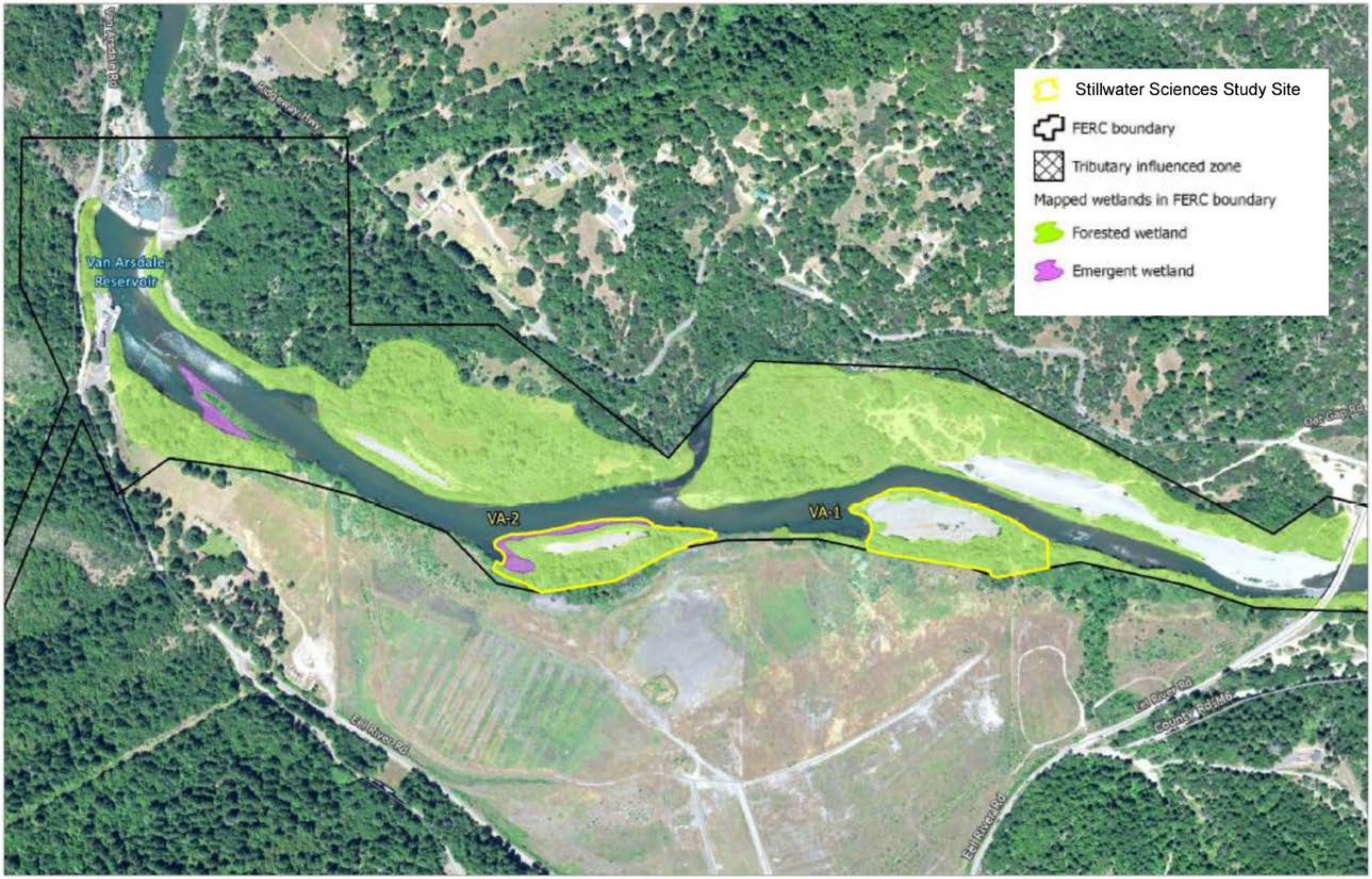
1. Note that narrow bands of riparian vegetation likely line the banks of the Eel River below Van Arsdale Reservoir. NWI lacks fine-scale resolution to detect these smaller habitat types (USFWS 2024a).

This Page Intentionally Left Blank



This preliminary figure was developed by Stillwater Sciences as part of the TERR 1 – Botanical Resources Data Memorialization Technical Study Summary (PG&E 2019).

Figure 3.3.4-1. Preliminary wetlands mapped at Lake Pillsbury.



This preliminary figure was developed by Stillwater Sciences as part of the TERR 1 – Botanical Resources Data Memorialization Technical Study Summary (PG&E 2019).

Figure 3.3.4-2. Preliminary wetlands mapped at Van Arsdale Reservoir.

3.3.4.5 References

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, eds. 2012. The Jepson Manual: Vascular Plants of California, Second Edition. University of California Press, Berkeley.

Cal-IPC (California Invasive Plant Council). 2024. California Invasive Plant Inventory Database. Available at: www.cal-ipc.org/paf. Accessed May 2024. Berkeley, California.

CDFA (California Department of Food and Agriculture). 2024. California Noxious Weeds. Available at: https://www.cdfa.ca.gov/plant/IPC/encycloweedia/weedinfo/winfo_table-sciname.html. Accessed May 2024. CDFA, Plant Health and Pest Prevention Services.

CDFW (California Department of Fish and Wildlife). 2024. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication, April. CDFW, California Natural Diversity Database.

CNDDB (California Natural Diversity Database). 2024. California Natural Diversity Database. RareFind5. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed April 2024. CDFW, Natural Heritage Division, Sacramento, California.

CNPS (California Native Plant Society). 2024. Inventory of Rare and Endangered Plants (online edition, v9.5). Available at: http://www.rareplants.cnps.org. Accessed April 2024. Sacramento, CA.

Coop, J.D., S.A. Parks, C.S. Stevens-Rumann, S.D. Crausbay, P.E. Higuera, M.D. Hurteau, A. Tepley, E. Whitman, T. Assal, B.M. Collins, K.T. Davis, S. Dobrowski, D.A. Falk, P.J. Fornwalt, P.Z. Fulè, B.J. Harvey, V.R. Kane, C.E. Littlefield, E.Q. Margolis, M. North, M.-A. Parisien, S. Prichard, and K.C. Rodman. 2020. Wildfire-driven forest conversion in western North American landscapes. BioScience 70(8): 659–73.

Keeley, J.E., J. Franklin, and C. D'Antonio. 2011. Fire and invasive plants on California landscapes. In: McKenzie, D., C. Miller, and D. Falk (eds.), The Landscape Ecology of Fire. Ecological Studies, Volume 213. Springer, Dordrecht.

NMFS (National Marine Fisheries Service). 2002. Biological Opinion for the proposed license amendment for the Potter Valley Project (FERC Project Number 77-110). NMFS, Southwest Region.

PG&E (Pacific Gas and Electric Company). 2019. TERR 1 – Botanical Resources Data Memorialization, Technical Study Summary. Stillwater Sciences. Prepared for Pacific Gas and Electric Company (Susan Kester). Potter Valley Project (FERC Project No. 77). December 5, 2019.

Sonoma County Water Agency. 2016. Vegetation and wildlife. Chapter 4.4 in: Fish Habitat Flows and Water Rights Project, Draft Environmental Impact Report. Santa Rosa, California.

Steel, Z.L., M.J. Koontz, and H.D. Safford. 2018. The changing landscape of wildfire: burn pattern trends and implications for California's yellow pine and mixed conifer forests. Landscape Ecology 33(7):1,159–176.

USACE (U.S. Army Corps of Engineers). 2015. Lake Pillsbury Boat Ramp Project application for letter of permission.

USFS (U.S. Forest Service). 2016a. CALVEG Zone 1: North Coast – Mid-vegetation maps using the Regional Dominant classification. Available at: https://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192. Accessed November 2016.

USFS (U.S. Forest Service). 2016b. Natural Resources Information System database for special-status species occurrences.

USFS (U.S. Forest Service). 2016c. GIS information from the Mendocino National Forest on non-native invasive plant species.

USFS (U.S. Forest Service). 2015. Proposed, endangered, and threatened species and designated critical habitat on or near the Mendocino National Forest, the Red Bluff Recreation Area, and/or the Genetic Resource Conservation Center. Prepared by the MNF, Willows, California.

USFWS (U.S. Fish and Wildlife Service). 2024a. National Wetlands Inventory. Online Database. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available at: https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/.

USFWS (U.S. Fish and Wildlife Service). 2024b. Federal endangered and threatened species that occur in or may be affected by projects in the counties and/or USGS 7.5-minute quads requested. Endangered Species Program, Sacramento, California.

Appendix 3.3.4-A

Descriptions of CALVEG Vegetation Alliances in the Study Area

This Page Intentionally Left Blank

Provided below is a brief description of CalVeg vegetation communities and non-vegetated areas identified in the Project vicinity. Vegetation community and non-vegetated area descriptions and nomenclature are based on *Vegetation Descriptions. North Coast and Montane Ecological Province – CALVEG Zone 1* (U.S. Forest Service 2008[2]).

HERB-DOMINATED VEGETATION COMMUNITIES

Pastures and Crop Agriculture (A6)

Irrigated or dry crop agriculture is usually harvested in rows as edible herbaceous products such as cereals (wheat, sorghum, oats, millet, corn, rye, etc.) and vegetables (squash, celery, beans, peas, etc.) for stock and human uses. Agricultural crop fields are also occasionally planted for both animal forage and to improve nitrogen levels, as with legumes such as alfalfa and sweet 26 clovers. Certain crops are grown for other multiple uses, such as flax and cotton for seed oils (linseed and cottonseed), fibers and medicinal uses, if any.

Pickleweed – Cordgrass (HC)

Coastal brackish or salt marshes commonly occur in various subsections of the Coast Section, such as Humboldt Bay Flats and Terraces, Point Reyes, Coastal Hills - Santa Rosa Plain Subsections and others. They are prevalent along Humboldt Bay, estuaries of the Smith, Klamath and Eel Rivers and around San Francisco Bay. Usually dominated by Common Pickleweed (*Salicornia virginica*) and California Cordgrass (*Spartina foliosa*), coastal salt marshes also may include invasive non-native species such as Salt Water and Dense-flowered Cordgrasses (*Spartina alterniflora*, *Spartina densiflora*) in northern California. Jaumea (*Jaumea carnosa*) and Saltgrass (*Distichlis spicata*) are also associated with these wet sites.

Annual Grasses and Forbs (HG)

Annual grass and forb communities are dominated by introduced annual grasses in the genera *Bromus*, *Vulpia*, *Avena*, and *Lolium*. HG may occur as a pure patch or as an understory layer in other communities. Native species that may occur include bluegrass *Poa annua*), purple needlegrass (*Nassella pulchra*), Idaho fescue (*Festuca idahoensis*), and California poppy (*Eschscholzia californica*).

Perennial Grasses/Forbs Alliance (HM)

Perennial grass and forb communities are dominated by introduced grasses in the genera *Achnatherum*, *Bromus*, *festuca* and *Agropyron.* This Alliance has been mapped widely across twenty-two subsections in the three sections of this zone and at elevations up to about 7600 feet. It is a form of dry to moist grassland in which it is difficult to determine species composition due to its great variability across the state. Disturbance usually is a factor in the maintenance of this type. Associated forbs of this type also include Rock Cress (*Arabis* spp.), Monardella (*Monardella*

[2] U.S. Forest Service. 2008. North Coast and Montane Ecological Province. CALVEG Zone 1. December 11, 2008.

spp.) the non-native Strawberry Clover (*Trifolium fragiferum*), Buckwheat (*Eriogonum* spp.), and occasionally alpine forbs such as Sierra Primrose (*Primula suffrutescens*).

SHRUB-DOMINATED VEGETATION COMMUNITIES

Chamise Alliance (CA)

Chamise (*Adenostoma fasciculatum*) reaches its northeastern most distribution limits in Tehama County. As a dominant shrub type, Chamise has been mapped abundantly in fifteen subsections of this zone at elevations up to about 4800 feet. It may become locally common on low-elevation, xeric sites in southern areas due to its vigorous crown-sprouting abilities after ground disturbances such as intense fires. Chamise is especially likely to dominate south-facing slopes below or adjacent to the Lower Montane Mixed Chaparral type. Chaparral species such as Wedgeleaf Ceanothus (*Ceanothus cuneatus*), Shrub Canyon Live Oak (*Quercus chrysolepis* var. *nana*), and Manzanitas (*Arctostaphylos* spp.) may associate on steeper or more mesic locations. Conifers such as Douglas-fir (*Pseudotsuga menziesii*), Knobcone Pine (*Pinus 2ttenuate)* and Gray Pine (*P. sabiniana*) are often found adjacent to or intermixed with these stands.

Salal – California Huckleberry Alliance (CB)

Salal (*Gaultheria shallon*) occurs abundantly in the westernmost edges of the Mountains Section near the coast at elevations below about 2600 feet (800 m). Salal is a conspicuous element in this type, but may not be dominant in the mixture at different locations. A well-developed shrub layer in this type usually occurs on moist, productive soils associated with the coastal conifers Redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*) when overstory conifers are removed. California Huckleberry (*Vaccinium ovatum*) is the most common shrub associate. In addition, Red Alder (*Alnus rubra*), Dwarf Oregon Grape (*Berberis nervosa*), California Rose-Bay (*Rhododendron macrophyllum*), various ferns, and Blackberry (*Rubus* spp.) are often associated with Salal in the mixture.

Brewer Oak (CJ)

Dense Brewer Oak (*Quercus garryana* var. *breweri*) thickets occur in scattered areas of the Eastern Franciscan Subsection of the Ranges and in the Scott Bar Mountains and Lower Scott Mountains Subsections of the Mountains Section. This type occurs sparsely on dry sites in other areas as well, having been mapped in nine other subsections across the three sections. It generally develops within an elevation range of about 2000 – 6400 feet (610 – 1952 m). On poorer, drier or lower elevation sites, shrub Brewer Oak stands may grade into the Lower Montane Mixed Chaparral type or on better sites, into tree-sized Oregon White Oak (*Quercus garryana* var. *garryana*) communities. Typical conifer associates include Douglas-fir (*Pseudotsuga menziesii*), Ponderosa Pine (*Pinus ponderosa*) and White Fir (*Abies concolor*).

Coyote Brush (CK)

Coyote Brush (*Baccharis pilularis*) may be the main shrub of certain coastal bluffs, slopes, terraces or sand dunes of northern California, increasing in dominance towards the San Francisco Bay area. It also pioneers recently logged sites in the northwest at some distance from the coast. Coyote

Brush sites, such as those in the Marin Hills and Valleys and Point Reyes Subsections of the Coast Section, may develop a diversity and moderately dense cover of other shrubs and ferns such as Poison Oak (*Toxicodendron diversilobum*), Coffeeberry (*Rhamnus californica*), Western Sword Fern (*Polystichum munitum*), Bracken (*Pteridium aquilinum*), California Blackberry (*Rubus ursinus*), Blueblossom (*Ceanothus thyrsiflorus*), as well as perennial herbs and grasses such as Purple Needlegrass (*Nassella pulchra*), Tufted Hairgrass (*Deschampsia caespitosa*), California Oatgrass (*Danthonia californica*), Yellow Bush Lupine (*Lupinus arboreus*) and Dune Lupine (*Lupinus chamissonis*). This alliance has been mapped widely within thirteen subsections of this zone at low elevations. It is associated with coastal trees such as Douglas-fir (*Pseudotsuga menziesii*) and California Bay (*Umbellularia californica*) as well as an abundance of non-native grasses and forbs.

Wedgeleaf Ceanothus Alliance (CL)

Wedgeleaf Ceanothus (*Ceanothus cuneatus*) is widely distributed throughout California on low- to mid-elevation chaparral sites and is usually a major component of the Lower Montane Mixed Chaparral type. These are often disturbed or burned areas and have been mapped at elevations up to about 5600 feet. Three associates include Douglas-fir (*Pseudotsuga menziesii*), Ponderosa Pine (*Pinus ponderosa*), Oregon White Oak (*Quercus garryana*), and in the east, Western Juniper (*Juniperus occidentalis* var. *occidentalis*).

Lower Montane Mixed Chaparral (CQ)

This low-elevation mixed shrub community occurs scattered in foothill areas between 750 to 6,350 feet in elevation. CQ includes a mixture of whiteleaf manzanita (*Arctostaphylos viscida*), common manzanita (*Arctostaphylos manzanita*), wedgeleaf ceanothus *(Ceanothus cuneatus)*, lemmon ceanothus (*Ceanothus lemmonii*), chaparral whitethorn (*Ceanothus leucodermis*), chamise (*Adenostoma fasciculatum)*, Fremont silktassel (*Garrya fremontii*), birchleaf mountain mahogany (*Cercocarpus betuloides*), poison oak (*Toxicodendron diversilobum*), various shrub oaks (*Quercus* spp.), hoary coffeeberry (*Rhamnus tomentella*), and other lower elevation shrub species.

Scrub Oak (CS)

Scattered areas dominated by shrubby oak species (*Quercus* spp.) have been mapped at elevations generally below about 5000 feet where soils are sufficiently deep or shaded in this zone. This type has been mapped widely and abundantly across this zone in twenty-one subsections. True Scrub Oak (*Quercus berberidifolia*) is rare in the northern part of this Province, reaching its northern limit in eastern Tehama County. Associated species of the Scrub Oak type may also include minor amounts of Brewer Oak (*Quercus garryana* var. *breweri*), Chamise (*Adenostoma fasciculatum*), Manzanita (*Arctostaphylos* spp.) and other chaparral species.

Whiteleaf Manzanita Alliance (CW)

Two forms of Whiteleaf Manzanita (*Arctostaphylos viscida var. viscida*) and Mariposa Manzanita (*Arctostaphylos viscida var. mariposa*) assume dominance on dry slopes in the same elevation range as Ponderosa Pine and the Mixed Conifer – Pine Alliances in the southern Sierra Nevada.

These varieties are merged in the Whiteleaf Manzanita Alliance, which occurs more prominently toward the west (Central Valley CALVEG Zone) and less commonly in this zone. The Alliance has been mapped in scattered locations of five subsections, chiefly between about 2600–5400 ft. The species is usually found on south and west aspects or on rocky or infertile soils in association with Chamise (*Adenostoma fasciculatum*) and other lower elevation shrubs and Canyon Live Oak (*Quercus chrysolepis*).

Upper Montane Mixed Chaparral Alliance (CX)

The Upper Montane Mixed Shrub type is a high-elevation shrub community that occurs in widely scattered openings within White Fir (*Abies concolor*) and Red Fir (*A. magnifica)* forests. Elevations are usually above about 4800 feet. In many cases the species are a mixture of Pinemat Manzanita (*Arctostaphylos nevadensis*), Bush Chinquapin (*Chrysolepis sempervirens*), Shrub Tanoak (*Lithocarpus densiflorus* var. *echinoides*) and Huckleberry Oak (*Quercus vaccinifolia*). Bitter Cherry (*Prunus* emarginata) and Rock Spiraea (*Holodiscus microphyllus*) may occasionally be associated. At lower elevations, Greenleaf Manzanita (*A. patula*) and Snowbrush (*Ceanothus velutinus*) may also be present, but these shrubs are more closely identified with the Upper Montane Mixed Chaparral type.

North Coast Mixed Shrub (NC)

Shrubby coastal areas of northern California having no clear single dominant shrub species are identified in the North Coastal Scrub Alliance. It occurs westward of Redwood (*Sequoia sempervirens*) forests in eleven subsections of the Coast Section, being especially prominent in the Crescent City Plain Subsection. Elevations generally range from sea level to 3600 feet (1098 m). Environmental conditions that separate subsets of this type include proximity to the coast and exposure to winds and salt deposition, depth and texture of soils, topography, and the repeated occurrence of fire. For example, Holland (1986) identifies northern maritime chaparral, northern coastal scrub, northern coastal bluff scrub, northern dune scrub and other coastal shrub types in the general area of this section. Barbour and Major (1988) discuss northern coastal scrub types with an abundance of either Coyote Brush (*Baccharis pilularis*) or species of lupine such as Yellow Bush Lupine (*Lupinus arboreus*). Lupine types are best developed on level terraces close to coastal bluffs from Santa Cruz to Sonoma Counties. Other shrubs common in this type include Blueblossom (*Ceanothus thyrsiflorus*), Coastal Whitethorn (*C. incanus*), Hairy Manzanita (*Arctostaphylos columbiana*), Coffeeberry (*Rhamnus californica*), Salal (*Gaultheria shallon*), California Huckleberry (*Vaccinum ovatum*), California Blackberry (Rubus ursinus), Poison Oak (*Toxicodendron diversilobum*), Wax Myrtle (Myrica californica) and shorter forms of California Bay (*Umbellularia californica*). Grasses and forbs such as European Beachgrass (*Ammophila arenaria*), which is often planted for dune stabilization, Western Sword Fern (*Polystichum munitum*) and wetland trees and shrubs such as Red Alder (*Alnus rubra*) and Willows (*Salix* spp.), may be more common towards the northern end of this section.

Riparian Mixed Shrub Alliance (NM)

This type represents a community of shrubs in riparian, seep and moist meadow sites in which no single species achieves dominance in the mapped area. The Riparian Mixed Shrub Alliance usually has a permanent water source at the surface that provides moisture to its obligate hydrophytes such as shrub Willows (*Salix* spp.), Water Birch (*Betula occidentalis*), Mountain Alder (*Alnus incana ssp. tenuifolia*), Sitka Alder (*A. viridis* spp. *sinuata*) or other shrubby Alders. Shrubs requiring shade or generally moist conditions such as Blackberry or Gooseberry species (*Rubus* spp., *Ribes* spp.) and Elderberry (*Sambucus* spp.) and/or Interior Rose (*Rosa woodsii*) towards the east may also be included in this mixture. It has been mapped sparsely in four subsections of the Mountains Section at elevations ranging up to about 5600 feet (1646 m).

Blueblossom Alliance (SC)

Blueblossom (*Ceanothus thyrsiflorus*) may be the dominant tall shrub in small open areas of the Coastal and Central Franciscan Subsections of the Coast Section. It also occurs in stands in other near-coastal subsections south to central California. Douglas-fir (*Pseudotsuga menziesii*) and Redwood (*Sequoia sempervirens*) associate with this shrub and form a sparse overstory in disturbed or open forested sites up to an elevation of about 1970 feet (600 m). Toyon (*Heteromeles arbutifolia*), Huckleberry (*Vaccinium* spp.), Coast Whitethorn (*Ceanothus incanus*), Scrub Oak (*Quercus berberidifolia*), Yellow Bush Lupine (*Lupinus arboreus*) and other shrubs may be present in these areas as well. Blueblossom is also a component of the Northern Coastal Scrub type in association with a variety of other shrubs such as Coyote Brush (*Baccharis pilularis*).

Manzanita Chaparral (SD)

Manzanitas (*Arctostaphylos* spp.) may occupy a shrubland site to the exclusion of other genera on drier or well-drained areas of northern California. Several species intermingle and it is difficult to identify a single dominant in some regions. The Manzanita type has mainly been mapped as scattered patches within six subsections of the three sections in this zone at elevations up to approximately 4800 feet. The Manzanita type is often found adjacent to lower elevation conifers such as Douglas-fir (*Pseudotsuga menziesii*), Gray Pine (*Pinus sabiniana*), Ponderosa Pine (P. ponderosa) and Knobcone Pine (*P. 5ttenuate*) and a variety of tree Oaks (*Quercus* spp.). Mesic Lower Montane Mixed Chaparral shrubs such as Scrub Oak (*Quercus berberidifolia),* Poison Oak (*Toxicodendron diversilobum*) and Cherry (Prunus spp.) may also occur in minor amounts in this type in addition to shrubs tolerant of serpentine soils such as Jepson Ceanothus (*C. jepsonii*), Wedgeleaf Ceanothus (*C. cuneatus*) and Huckleberry Oak (*Q.vaccinifolia*).

Willow (Shrub) Alliance (WL)

Shrub forms of Willow (*Salix* spp.) are mapped as this alliance where they dominate the shrub layer in a riparian, seep or meadow site. Since this zone is usually well-watered, the Willow group is widespread and has been mapped broadly in twelve subsections of the Coast, seventeen subsections of the Mountains and three subsections of the Ranges Sections. Elevations are generally below about 6800 feet (2074 m). This diverse group of stands may include any of the following native shrubby species in this area of the state: Gray (*S. bebbiana*), Booth’s (*S. boothii*), Del Norte (*S. delnortensis*), Sierra (*S. eastwoodiae*), Narrow-leaved (*S. exigua*), Hooker (*S. hookeriana*), Brewer’s (*S. breweri*), Arroyo (*S. lasiolepis*), Lemmon’s (*S. lemmonii*), Dusky *(S. melanopsis*), Mackenzie’s (*S. prolixa*), Scouler’s (*S. scouleriana*), Sandbar (*S. sessilifolia*), Sitka (*S. sitchensis*) and possibly others. Tree and shrub upland associates of these riparian stands include coastal conifers such as Douglas-fir (*Pseudotsuga menziesii*), Grand Fir (*Abies grandis*) and Sitka Spruce (*Picea sitchensis*), hardwoods such as Red Alder (*Alnus rubra*), California Bay

(*Umbellularia californica*), tree Willows (other *Salix* spp.), and shrubs such as Coyote Bush (*Baccharis pilularis*), Salal (*Gaultheria shallon*) and California Huckleberry (*Vaccinium ovatum*).

Birchleaf Mountain Mahogany Alliance (WM)

Birchleaf Mountain Mahogany (*Cercocarpus betuloides*, also called *C. montanus*) may occasionally occur in pure stands on xeric, semi-desert, cliff, or even moist sites to the exclusion of other species. The Birchleaf Mountain Mahogany Alliance, where it is the dominant shrub, has been mapped infrequently on slopes in the southern Sierras within the Lower Batholith, Tehachapi – Piute Mountains, Eastern Slopes and Upper Foothills Metamorphic Belt Subsections. Elevations of these sites are within the range from about 2000–6200 ft. Canyon and Interior Live Oaks (*Quercus chrysolepis*, *Q*). *wislizenii*), and other Lower Montane Chaparral shrubs such as Chamise (*Adenostoma fasciculatum*) are associated with this type in this region.

TREE-DOMINATED COMMUNITIES

Pacific Douglas-Fir (DF)

Douglas-fir (*Pseudotsuga menziesii*) is the dominant overstory conifer over a large area in the Mountains, Coast, and Ranges Sections. This alliance has been mapped at various densities in most subsections of this zone at elevations usually below 5,600 feet (1,708 m). Sugar Pine (*Pinus lambertiana*) is a common conifer associate in some areas. Tanoak (*Lithocarpus densiflorus* var. *densiflorus*) is the most common hardwood associate on mesic sites towards the west. Along the western edges of the Mountains Section, a scattered overstory of Douglas-fir often exists over a continuous Tanoak understory with occasional Madrones (*Arbutus menziesii*). When Douglas-fir develops a closed-crown overstory, Tanoak may occur in its shrub form (*Lithocarpus densiflorus* var. *echinoides*). Canyon Live Oak (Quercus chrysolepis) becomes an important hardwood associate on steeper or drier slopes and those underlain by shallow soils. Black Oak (*Q. kelloggii*) may often be associated with this conifer but usually is not abundant. In addition, any of the following tree species may be sparsely present in Douglas-fir stands: Redwood (*Sequoia sempervirens),* Ponderosa Pine (*Pinus ponderosa*), Incense Cedar (Calocedrus decurrens), White Fir (Abies concolor), Oregon White Oak (*Q garryana*), Bigleaf Maple (*Acer macrophyllum*), California Bay (Umbellifera californica), and Tree Chinquapin (*Chrysolepis chrysophylla*). The shrub understory may also be quite diverse, including Huckleberry Oak (*Q. vaccinifolia*), Salal (*Gaultheria shallon*), California Huckleberry (*Vaccinium ovatum*), California Hazelnut (*Corylus cornuta* var. *californica*), Poison Oak (*Toxicodendron diversilobum*), Oceanspray (*Holodiscus discolor*), Hairy Honeysuckle (*Lonicera hispidula*) and a wide range of other shrubs and forbs.

Douglas-Fir – Ponderosa Pine (DP)

The Douglas-fir–pine community occurs below 5,900 feet in elevation and is characterized by Douglas-fir (*Pseudotsuga menziesii)* and ponderosa pine (Pinus ponderosa). The shrub community most commonly associated with the Douglas-fir–pine is lower montane mixed chaparral, including species such as wedgeleaf ceanothus, whiteleaf manzanita, and poison oak.

Coastal Mixed Hardwood (EX)

This alliance is the southerly and westernmost of several upland mixed hardwood types in this region that have no single dominant hardwood species. It occurs sparsely in the San Pablo Bay Flats, Coastal Hills – Santa Rosa Plain, Marin Hills and Valleys and Mount St. Helena Flows and Valleys Subsections of the Coast Section and in the Central Franciscan Subsection of the Ranges Section below about 2000 feet. Indicator species of this type are principally Coast Live Oak (*Quercus agrifolia*), California Bay (*Umbellifera californica*) and Oregon White Oak (*Q. garryana*). Conifers occurring in minor amounts may include Gray Pine (*Pinus sabiniana*) and Ponderosa Pine (*P. ponderosa*).

Knobcone Pine (KP)

Knobcone Pine (*Pinus attentuata*) forms pure and often even-aged dense stands in burned or nutrient-poor areas of low to moderate elevations in this zone. The type is usually found below 4800 feet within chaparral or lower coniferous areas but may occur above 5000 feet in eastern areas of the Mountains Section. Knobcone Pine may also be found on ultramafic or other infertile or dry soils and has been mapped within twenty-eight subsections of the three sections at varying frequencies and stand densities. Hardwoods such as California Black and Oregon White Oaks (*Quercus kelloggii, Q. garryana*), Canyon Live Oak (*Q. chrysolepis*), and Tanoak (*Lithocarpus densiflorus*) occur in these stands as well as a variety of shrubs such as shrubby oaks (*Quercus* spp.), Chamise (*Adenostoma fasciculatum*), Whiteleaf Manzanita (Arctostaphylos viscida), and other species of Manzanita (*Arctostaphylos spp*.).

Mixed Conifer–Pine (MP)

The mixed conifer–pine community occupies moist soils across a range of sites between approximately 1,900 and 7,800 feet in elevation. MP is defined by the presence of several conifer species, including ponderosa pine, incense cedar, Douglas-fir, white fir, and sugar pine, with Jeffrey pine occurring very rarely. Any one of these species may become locally dominant over small areas. Riparian habitats within this community are characterized by the presence of white alder, maple, and willow. Understory shrubs in this community include deerbrush and whiteleaf manzanita at lower elevations, and greenleaf manzanita at higher elevations.

Riparian Mixed Hardwoods (NR)

The mixed riparian hardwoods community occurs along rivers and streams and includes a mixture of riparian hardwood species with no clearly dominant species. The mixture includes combinations of quaking aspen (*Populus tremuloides*), willow, and black cottonwood.

Interior Mixed Hardwoods (NX)

No single species is dominant in the Interior Mixed Hardwood Alliance, a mixture that has been mapped most extensively in the Central Franciscan and Ultrabasic Complex Subsections of the Mountains Section and the Mount St. Helena Flows and Valleys, Coast Franciscan and Marin Hills and Valleys Subsections of the Coast Section. It also occurs with less abundance in thirteen other subsections in all three sections. The mixture in this area includes diverse proportions of Oregon White (Quercus garryana), Canyon Live (Q. chrysolepis) and Blue (Q. douglasii) Oaks, with lesser amounts of California Bay (Umbellifera californica) and Coast Live Oak (Q. agrifolia). Conifer associates are mainly Douglas-fir (Pseudotsuga menziesii) and in western areas, Redwood (Sequoia sempervirens). This alliance has been mapped at elevations generally below about 4000 feet. Annual grasses and forbs typically occur in these open sites.

Gray Pine (PD)

Gray Pine (*Pinus sabiniana*) reaches its northernmost distribution in the Mountains (this zone) and Southern Cascades Sections (North Interior CALVEG zone) of California. This type has been mapped sparsely in the Coast Section (two subsections) and more abundantly in the Mountains (nine subsections) and Ranges Sections (six subsections) on a variety of dry sites in this region of the state. Stands in which it is the dominant emergent conifer are typically diverse and very open, with a mixture of hardwoods such as Blue Oak (*Quercus douglasii*), Oregon White Oak (*Q. garryana*), Canyon Live Oak (*Q. chrysolepis*), Pacific Madrone (*Arbutus menziesii*) and low-elevation chaparral shrubs such as Chamise (*Adenostoma fasciculatum),* shrub oaks (*Quercus* spp.), Whiteleaf and Common Manzanita (*Arctostaphylos viscida, A. manzanita*) and Wedgeleaf Ceanothus (*Ceanothus cuneatus*). Annual grasslands are sometimes found adjacent to Gray Pine stands and may form the ground layer in very open stands. These areas are often associated with ultramafic soils such as in the South Fork of the Salmon River where Jeffrey Pine (*Pinus jeffreyi*) and Leather Oak (*Q. durata*) may be present.

Ponderosa Pine (PP)

Ponderosa Pine (*Pinus ponderosa*) may become a dominant conifer on well-drained, often droughty, non-serpentinized soils, such as coarse-textured alluvial sites and southwest-facing or steep slopes. Typically, pure to nearly pure stands occur in scattered patches below the Mixed Conifer - Fir, above the Lower Montane Mixed Chaparral type and adjacent to the Douglas-fir - Ponderosa Pine and Mixed Conifer - Pine types of this region. The many minor associates in these open stands include California Black Oak (*Quercus kelloggii*), Canyon Live Oak (*Q. chrysolepis*), Oregon White Oak (*Q. garryana*), Douglas-fir (*Pseudotsuga menziesii*) and White Fir (Abies concolor) in various regions. Whiteleaf Manzanita (*Arctostaphylos viscida)* and annual grasses such as Bromus spp. may associate with it on alluvial soils. Wedgeleaf Ceanothus (*Ceanothus cuneatus*) and Whiteleaf Manzanita (*Arctostaphylos viscida*) may become important associated shrubs in the Mountains Section.

California Bay (QB)

This woodland type is almost completely composed of California Bay (*Umbellularia californica).* It occurs in scattered small stands, generally away from the immediate coast on exposed slopes and ridges from the Oregon border southward below about 3000 feet in eleven subsections in the Coast and three subsections of the Ranges Sections. California Bay also is adapted to seawinds of coastal environments, especially towards the south. For example, this type has been mapped extensively in the Marin Hills and Valley Subsection (Coast), where it associates with trees and shrubs such as Redwood (*Sequoia sempervirens),* Douglas-fir (*Pseudotsuga menziesii*), Tanoak (*Lithocarpus densiflorus*) and Coyote Bush (*Baccharis pilularis*) near the coast. Other hardwoods such as Canyon and Coast Live Oaks (*Quercus chrysolepis, Q. agrifolia*) may be found in these stands further inland. Tree Chinquapin (*Chrysolepis chrysophylla*), Berries (*Rubus* spp.), and species of Ceanothus may also occur as minor associates of this type.

Canyon Live Oak (QC)

The Canyon Live Oak vegetation community occurs at about 6000 ft in elevation, often on south- or southwest-facing slopes. Associated trees typically include low- to mid-elevation conifers such as Douglas-fir (*Pseudotsuga menziesii*), Gray Pine (*Pinus sabiniana*), Ponderosa Pine (P. ponderosa), Knobcone Pine (*P. attenuata*) and Redwood (Sequoia sempervirens). Hardwoods such as Oregon White Oak (Q. garryana), California Black Oak (*Q. kelloggii*) and Tanoak (*Lithocarpus densiflorus)* readily mix in stands with this oak, especially in the several mixed hardwood alliances.

Blue Oak (QD)

The Blue Oak (*Quercus douglasii)* community occurs on gentle slopes up to approximately 3,300 feet in elevation. It may occur in pure or mixed stands, and it is often found in close association with other vegetation communities including gray pine, ponderosa pine, and Douglas-fir–pine communities. Other species found in this community include wedgeleaf ceanothus, whiteleaf manzanita, and poison oak.

White Alder (QE)

White alder communities occur in pure or mixed stands along rivers and streams, generally below about 6,200 feet in elevation. QE may include other tree species such as Pacific yew (*Taxus brevifolia*), California hazelnut (*Corylus cornuta* var. *californica*).

Fremont Cottonwood (QF)

Stands dominated by Fremont Cottonwood (*Populus fremontii)* occur in limited riparian areas of this zone. This Alliance has been mapped in small patches along the Russian River in the Central Franciscan Subsection of the Ranges Section and within seven other subsections of the three sections. Shrubby or tree-sized Willows (*Salix* spp.) may be present. Agricultural uses, especially vineyards, are often adjacent to this type in this zone.

Oregon White Oak (QG)

Mapped elevations of Oregon white oak are usually below about 5800 feet. Often developing on poor, exposed or droughty soils in inland valleys, foothills or rocky ridges, the Oregon White Oak type also is found in poorly drained areas having occasional standing water or next to stream terraces. On better sites, it is usually outcompeted by species such as Douglas-fir (*Pseudotsuga menziesii*) and California Black Oak (*Q. kelloggii*), often becoming a minor element in mixed hardwood types. Other associated species include other conifers such as Ponderosa Pine (*Pinus ponderosa*), Gray Pine (*P. sabiniana*) and Western Juniper (*Juniperus occidentalis* var. *occidentalis*), various Oaks (*Quercus* spp.), Wedgeleaf Ceanothus (*Ceanothus cuneatus*), Chamise (*Adenostoma fasciculatum*), and especially in recently burned areas, Deerbrush (*Ceanothus integerrimus*). Open sites often have a grass understory. The shrub form, Brewer Oak (*Quercus garryana* var. *breweri*), usually occupies higher elevations on shallow soils.

Madrone (QH)

Sites dominated by dense stands of Pacific Madrone (Arbutus menziesii) are rarely found except on relatively dry or steep sites at some distance from the immediate coast of northern California at elevations of 3200 ft. It is often associated with Oregon White Oak (Quercus garryana) and chaparral shrubs such as Chamise (Adenostoma fasciculatum) in interior locations. A prolific sprouter from underground burls, Pacific Madrone occupies stand-replacing fire sites rapidly, especially under conditions of bare mineral or shallow soils with limited canopy cover. Conditions become less favorable for its maintenance in dense stands as the canopy closes.

Black Oak (QK)

California Black Oak (*Quercus kelloggii*) occurs extensively in this zone at elevations up to about 6000 feet. It may develop into relatively pure stands on moderately steep slopes or may be associated with Oregon White Oak (*Q. garryana* var. *garryana*) and/or Canyon Live Oak (*Q. chrysolepis*) on drier or harsher sites. These stands are commonly found within or below the Douglas-fir (*Pseudotsuga menziesii*), Mixed Conifer - Pine and Ponderosa Pine (*Pinus ponderosa*) types, often as a result of fire or other disturbance, especially in Douglas-fir areas. Black Oak commonly is a major understory hardwood in those conifer types and also typically grows on better soils than those of the Canyon Live Oak-dominant type. Commonly associated shrubs include both upper and lower montane species such as various Manzanitas (*Arctostaphylos* spp.), shrub Oaks (*Quercus* spp.), Deerbrush (*Ceanothus intergerrimus*), Brewer Oak (*Q. garryana* var. *breweri*), and Wedgeleaf Ceanothus (*C. cuneatus*).

Valley Oak (QL)

Valley Oak (*Quercus lobata*) occurs in scattered occurrences in foothill woodlands, valleys, and floodplains west of the Sacramento River and on gentle, low-elevation montane slopes from Marin and Napa Counties to Mendocino County in this zone. The Valley Oak-dominated type has been identified mainly in six subsections of the Ranges Section, but also occurs sparsely in four subsections of the Coast and three subsections of the Mountains Sections. The oak is known to occur in California up to about 5600 feet elevation but has been mapped as a dominant hardwood type up to about 3400 feet. It is considered a species of concern due to habitat loss and specific germination requirements. Associated minor species within the type include Blue Oak (*Quercus douglasii*), Oregon White Oak (*Q. garryana*), low-elevation shrubs such as Chamise (*Adenostoma fasiculatum*) and annual grasses.

Willow (QO)

The willow community is wide-ranging, extending from approximately 2,100 to 8,600 feet in elevation. Species of tree and shrub willows dominate the hardwood mixture, and may include Scouler's willow (*Salix scouleriana*), shining willow (*Salix lucida*), Gooding's black willow (*Salix gooddingii*), and narrow-leaved willow (*Salix exigua*). QC may occur in pure stands along streams and moist canyon bottoms, or it may be mixed with conifers such as those in the mixed conifer–pine, mixed conifer–fir, and lodgepole pines. Willow–aspen, white alder, and black cottonwood communities may also be associated with the willow community.

Red Alder (QR)

Seasonally flooded or permanently saturated soils may develop stands dominated by Red Alder (*Alnus rubra*) in alluvial or upland positions of this zone. Red Alder often occurs in dense stands on mesic slopes in Humboldt and Del Norte Counties and further south in nine subsections of the Coast Section. It is found mainly in the Smith, Trinity and Klamath River 14 watersheds to an elevation of about 3000 feet (915 m). These pure stands are intermingled with conifers such as Redwood (Sequoia sempervirens), Douglas-fir (*Pseudotsuga menziesii*), Sitka Spruce (*Picea sitchensis*), and Grand Fir (*Abies grandis*). Short-lived Red Alder stands may develop after low-elevation logging operations accompanied by minor amounts of other hardwoods such as Bigleaf Maple (*Acer macrophyllum*) and Oregon Ash (*Fraxinus latifolia*). Shrubs and non-woody species such as Chain Fern (*Woodwardia fimbriata*), Spikenard (*Aralia californica*), Western Burning Bush (*Euonymus occidentalis*), American Dogwood (*Cornus sericea*), Sitka Alder (*A. virdis*) and Vine Maple (*Acer circinatum*) are occasionally also found. White Alder (*Alnus rhombifolia*) mixes with or replaces Red Alder on inland sites.

Tanoak (QT)

The Tanoak (Madrone) Alliance is an association of Tanoak (*Lithocarpus densiflorus*) with or without a Pacific Madrone (*Arbutus menziesii*) component. It is a very common type in this zone at elevations below about 4600 feet where soils and climate are sufficiently but not excessively moist. These stands are usually adjacent to Douglas- fir (*Pseudotsuga menziesii*) sites and are associated with hardwoods such as Oregon White (*Quercus garryana*) and Canyon Live Oaks (*Q. chrysolepis*). In many cases, however, the shrub and herbaceous layers tend to depauperate due to a dense Tanoak canopy.

Interior Live Oak (QW)

Interior live oak communities are generally found in association with gray pine, ponderosa pine, or Douglas-fir–pine communities between approximately 700 and 3,000 feet in elevation. Other trees found in this community may include black cottonwood (*Populus balsamifer ssp. trichocarpa*) and white alder.

Black Cottonwood Alliance (QX)

Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*) occurs in certain riparian areas in this zone, particularly along the Eel River drainage. Many of these areas are too small to map although this type has been mapped sparsely in six subsections in the three sections at elevations up to about 4400 feet (1342 m). Being shade intolerant, Black Cottonwood requires freshly deposited alluvial materials for its maintenance and stands are often even-aged as a result of episodic flood events. Tree and shrub Willows (*Salix* spp.), Oregon Ash (*Fraxinus latifolia*), Red and White Alders (*Alnus rubra*, *A. rhombifolia*) are sometimes present in this type. Very old stands may become dominated by shade tolerant coastal conifers such as Sitka Spruce (*Picea sitchensis*), Grand Fir (*Abies grandis*) or Western Hemlock (*Tsuga heterophylla*) with Black Cottonwood under the conifer canopy. Shrubs such as Vine Maple (*Acer circinatum*), Hawthorn (*Crataegus* spp.) and herbaceous plants such as Coast Nettle (*Urtica californica*) may be present as well. Black Cottonwood is replaced by Fremont Cottonwood (*P. fremontii*) in this region towards the south and east. At higher elevations and towards eastern California, Black Cottonwood occurs in association with Quaking Aspen (*P. tremuloides*) and White Alder (*A. rhombifolia*).

Willow–Alder (QY)

This community is generally found between 3,180 and 6,950 feet in elevation. Willow species, which in this Project vicinity may include Scouler's willow, shining willow, Gooding's black willow, and narrow-leaved willow, occur together with white alder, along streams or seepage areas. Neither taxon is clearly dominant in the riparian mixture. Common associates include species of gooseberry and currant (*Ribes* spp.), blackberry (*Rubus* spp.), wild rose (*Rosa* spp.), and poison oak.

Eucalyptus (QZ)

Several species of *Eucalyptus* have been planted extensively in California, especially blue gum (*E. globulus*) and red gum (*E. camaldulensis*), very often within or at the edges of agricultural fields or along roads or other developed landscapes. In the San Francisco Bay area, silver-leaved gum (*E. pulverulenta*) and silver dollar gum (*E. polyanthemos*) are also occasionally planted. Many widely scattered groves occur within nine subsections of the Coast Section, being especially prominent in the Marin Hills and Valleys, and Mount S. Helena Flows and Valleys Subsections. Many of these stands have become naturalized and mono-specific, since gums develop thick litter beds of exfoliated bark and leaves that do not decompose readily and that are detrimental to the establishment of other species. These sites are notoriously flammable.

Redwood – Douglas Fir (RD)

This mixture of Redwood (*Sequoia sempervirens*) and Pacific Douglas-fir (*Pseudotsuga menziesii*) occurs, usually in protected upland slopes up to approximately 3200 feet (976 m) elevation as mapped in fifteen subsections of this zone. The longitudinal 8 extent of the Redwood - Douglas-fir type is associated with a constant temperature and moisture regime that defines the Redwood fog belt. The eastern limit is determined by environments having more variable temperatures and lower humidity and moisture regimes than Redwood requires for its maintenance. It is especially prominent in the Northern and Coastal Franciscan, Fort Bragg Terraces and Point Arena Subsections of the Coast Section. Associated coastal trees within this type chiefly include Bishop Pine (*Pinus muricata*), Tanoak (*Lithocarpus densiflorus*), Red Alder (*Alnus rubra*), Madrone (*Arbutus menziesii*), California Bay (*Umbellifera californica*) and Oregon White Oak (*Quercus garryana*). California Hazelnut (*Corylus cornuta* var. *californica*) also occurs as an understory shrub in this type.

Redwood Alliance (RW)

Redwood (*Sequoia sempervirens*) occurs on alluvial flats, streamside terraces and colluvial slopes, generally within a narrow coastal strip within eleven subsections of the Coast Section and sparsely within two other subsections. In the northern portions of the Coast Franciscan Subsection, however, the type occupies sites further inland but which are still within the maritime influence. Elevations are typically below 2400 feet (732 m). Old-growth Redwood groves are mostly contained in national parks, state parks, and regional or private preserves. Soils underlying these sites are often a result of sediment deposition from continuous river flooding. Redwood Sorrel (*Oxalis oregana*) and Western Sword Fern (*Polysticum munitum*) are typical understory herbs in undisturbed groves. Other common associates are Pacific Douglas-fir (*Pseudotsuga menziesii*), Red Alder (*Alnus rubra*), Salal (*Gaultheria shallon*), Tanoak (*Lithocarpus densiflorus*), Western Hemlock (*Tsuga heterophylla*), California Hazelnut (*Corylus cornuta* var. *californica*) and California Rose-Bay (*Rhododendron macrophyllum*). The Redwood groves are geographically located in the coastal fog belt and are adjacent to Redwood – Douglas-fir, Sitka Spruce - Redwood, and Sitka Spruce forests.

Sitka Spruce (SK)

Sitka Spruce (*Picea sitchensis*) becomes a dominant conifer along certain fog-influenced coastal and near-coastal stretches of Humboldt and Del Norte Counties within six subsections of the Coast Section. This narrow strip often is underlain by alluvial or sandy stream floodplain deposits and supports wetland plants such as Red Alder (*Alnus rubra*), Yellow Skunk Cabbage (*Lysichiton americanum*) and Sedges (*Carex* spp.). This spruce mixes with Redwoods (*Sequoia sempervirens*) further inland or on slightly higher ground but where it achieves conifer dominance, it has been mapped at elevations below about 1200 feet (366 m). In Mendocino County, Beach Pine (*Pinus contorta* ssp. *contorta*) associates with Sitka Spruce on coastal sand dunes in the Fort Bragg Terraces Subsection of this Section. Grand Fir (*Abies grandis*) may be present in Sitka Spruce stands in the Humboldt Bay Flats and Terraces Subsection in Humboldt County. Other common associates of the Sitka Spruce-dominated type include the shrubs Salmonberry (Rubus spectabilis), Thimbleberry (*R. parviflorus*), Huckleberry (*Vaccinium* spp.), Salal (*Gaultheria shallon*) and Vine Maple (*Acer circinatum*), forbs such as Western Sword Fern (*Polystichum munitum*), and hardwoods such as Bigleaf Maple (*A. macrophyllum*).

Montane Mixed Hardwoods (TX)

The Montane Mixed Hardwood Alliance is a combination of three or more hardwoods species such as Black Oak (*Quercus kelloggii*), Tanoak (*Lithocarpus densiflorus*), Red Alder (Alnus rubra), Tree Chinquapin (*Chrysolepis chrysophylla*) and Madrone (*Arbutus menziesii*). This type has been mapped abundantly in four subsections of the Ranges Section, occasionally in seven subsections of the Coast and sixteen subsections of the Mountains Sections in a wide range of elevations up to about 5600 feet. This alliance often occurs adjacent to or as understory to Pacific Douglas-fir (*Pseudotsuga menziesii*) at its lower elevations and to mixed conifer forests somewhat higher. It is also found adjacent to the Redwood - Douglas-fir Alliance in the west and as an understory to other conifers such as pure Redwood (*Sequoia sempervirens*) stands and more rarely under the canopy of pure Ponderosa Pine (*Pinus ponderosa*) stands. Occasionally it occurs in proximity to shrubs in the upper and lower montane chaparral types such as Chamise (*Adenostoma fasciculatum*), shrub Oaks (*Quercus* spp.) and Greenleaf Manzanita (*Arctostaphylos patula*), agricultural or dry grasslands.

LAND USE AND NON-VEGETATED AREAS

Agriculture (AG)

Agricultural land is used primarily to produce food and fiber. High-altitude imagery indicates agricultural activity by distinctive geometric field and road patterns on the landscape and traces produced by mechanized equipment. Agricultural land uses include forest landscapes such as orchards as well as non-forested land uses such as vineyards and field crops. Land used exclusively for livestock pasture may, however, be mapped as annual grassland in those cases in which land uses are not recognizable.

Barren (BA)

A barren landscape is defined generally as an area devoid of vegetative cover. BA includes exposed bedrock and cliffs, but it does not include disturbed or developed areas that currently are degraded but could support vegetation under normal circumstances.

Dunes (DU)

The occurrence of coastal dunes in this zone is identified by those sandy accumulating areas in which coastal headlands are usually absent, such as near Ft. Bragg and Pt. Arena. Dunes have been mapped as a barren type of landscape, although finer scale mapping might identify considerable perennial species such as Morning-Glory (*Calystegia* spp.), Beach-bur (*Ambrosia chamissonis*) or Sand Verbena (*Abronia latifolia*), and perennial grasses such as American Dunegrass (*Leymus mollis*) and Sand-Dune Bluegrass (*Poa douglasii*).

Urban-related Bare Soil (IB)

Urban development in California occurs in phases. When land is cleared prior to being paved, this type represents the occurrence of non-vegetated barren ground that is caused by urbanization. This land use type also represents other mechanically caused barren ground, such as open quarries or mined areas, barren ground along highways and other areas cleared of vegetation prior to construction. This type often occurs adjacent to managed landscapes in already established urban centers or other paved areas.

Beach Sand (OS)

Oceanside littoral areas in California maintained as managed beaches rather than dunes for recreationists and residents. Such linear features are usually not vegetated. Some areas closer to land, however, are often planted and maintained with non-native shrub and herbaceous species that help to stabilize blowing sands and are aesthetically pleasing. Beach sand areas may fluctuate in width from year to year due to their erosion under storm conditions, lack of coarse sediment replenishment from other causes such as inappropriate placement of jetties as well as depositional events such as manual replacement of sand by beach managers.

Urban/Developed (UB)

This category applies to landscapes that are dominated by urban structures, residential units, or other developed land use elements such as highways, city parks, cemeteries and the like. In those cases in which the managed landscapes may have a considerable vegetation component, other land use categories may be more appropriate, such as Ornamental Conifer and hardwood mixtures within city parks.

Water (WA)

Water is labeled in Calveg mapping in those cases in which permanent sources of surface water are identified within a landscape unit of sufficient size to be mapped. The category includes lakes, streams and canals of various sizes, bays and estuaries and similar water bodies. These areas are considered to have a minimum of vegetation components, except along the 27 edges, which may be mapped as types such as Wet Meadows, Tule-Cattail freshwater marshes, or Pickleweed-Cordgrass saline or mixed marshes. Islands within water bodies may be mapped according to their terrestrial dominant vegetation types. Surface water bodies have recently been mapped separately in some parts of this zone under the following categories:

- W1: Rivers and Streams (natural, flowing surface waters)
- W2: Perennial Lakes and Ponds
- W3: Reservoirs (man-made lakes and ponds)
- W4: Bays or Estuaries (near-shore ocean features)
- W5: Playas (alkaline or halic desert basin features, formerly flooded)
- W6: Intermittent Stream Channel (seasonally flowing channeled waters)
- W7: Ocean W8: Intermittent or Seasonal Lake or Pond (occasionally drained surface waters)
- W9: Exposed non-water features (gravel, sand bars, cliff faces, etc.)

This Page Intentionally Left Blank

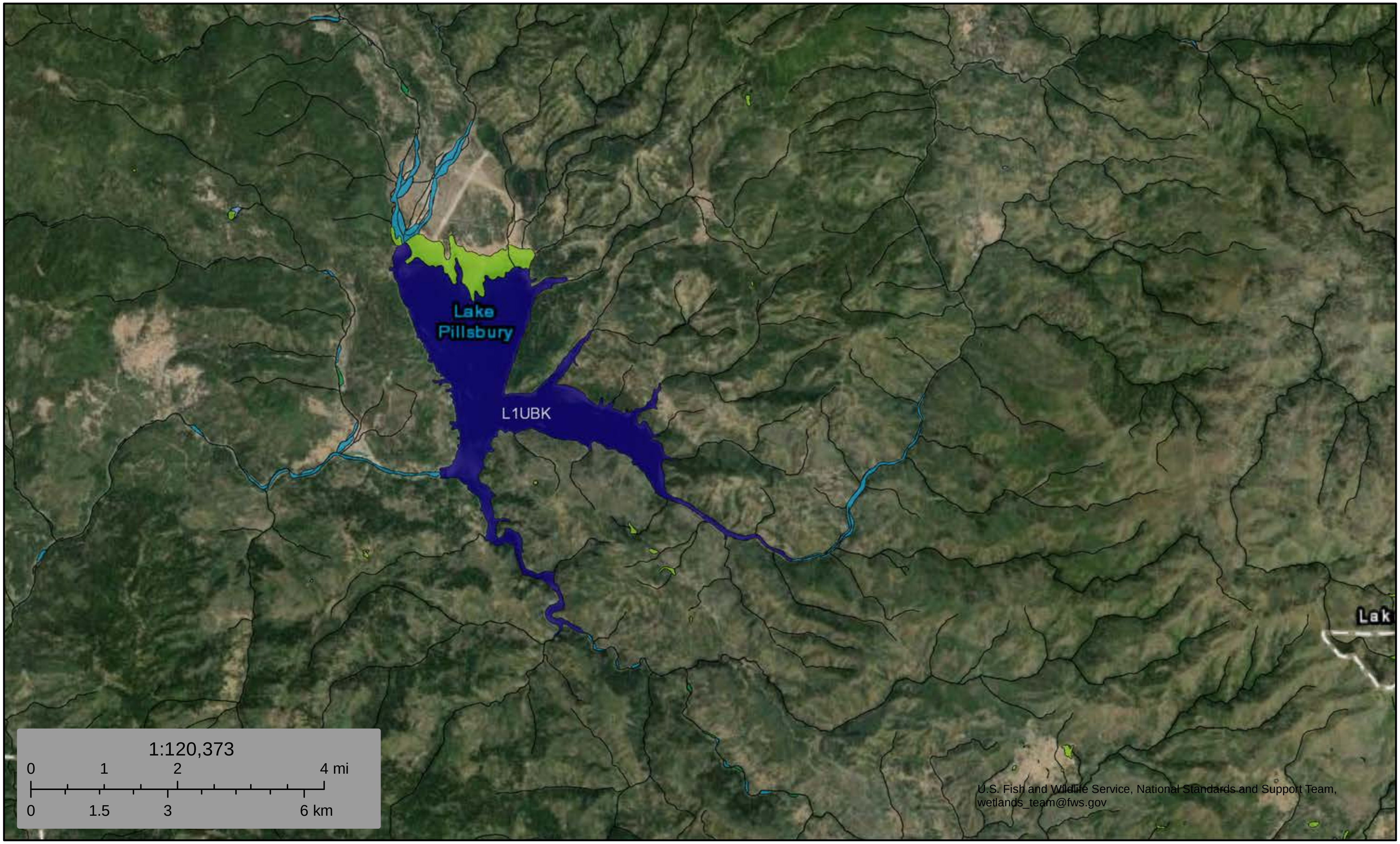
Appendix 3.3.4-B

USFWS NWI Wetland Maps of the Study Area

This Page Intentionally Left Blank

U.S. Fish and Wildlife Service
National Wetlands Inventory

Map 1 - Pillsbury Reservoir Vicinity



May 24, 2024

Wetlands

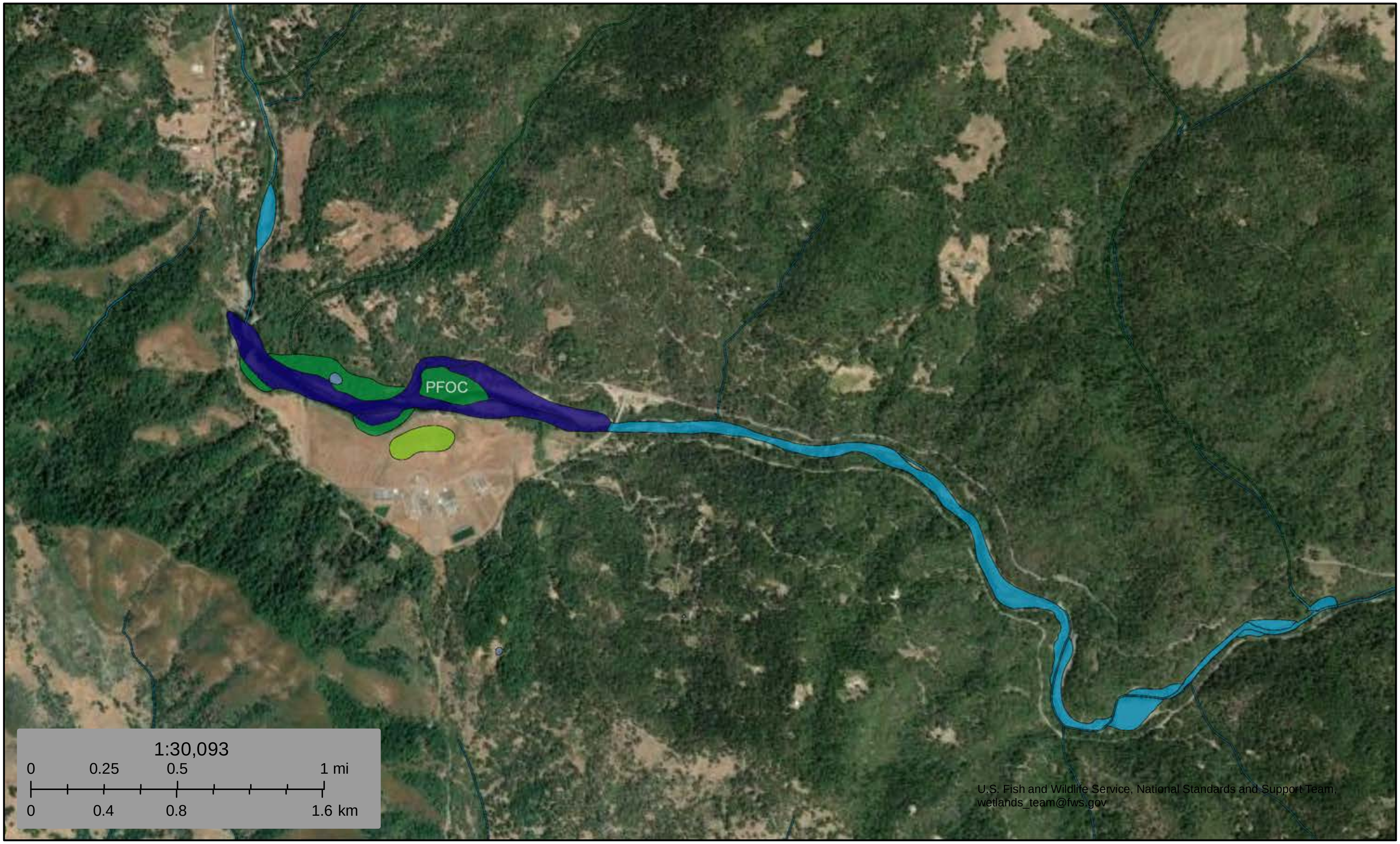
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Map 2 - Van Arsdale Reservoir Vicinity

U.S. Fish and Wildlife Service
National Wetlands Inventory



May 24, 2024

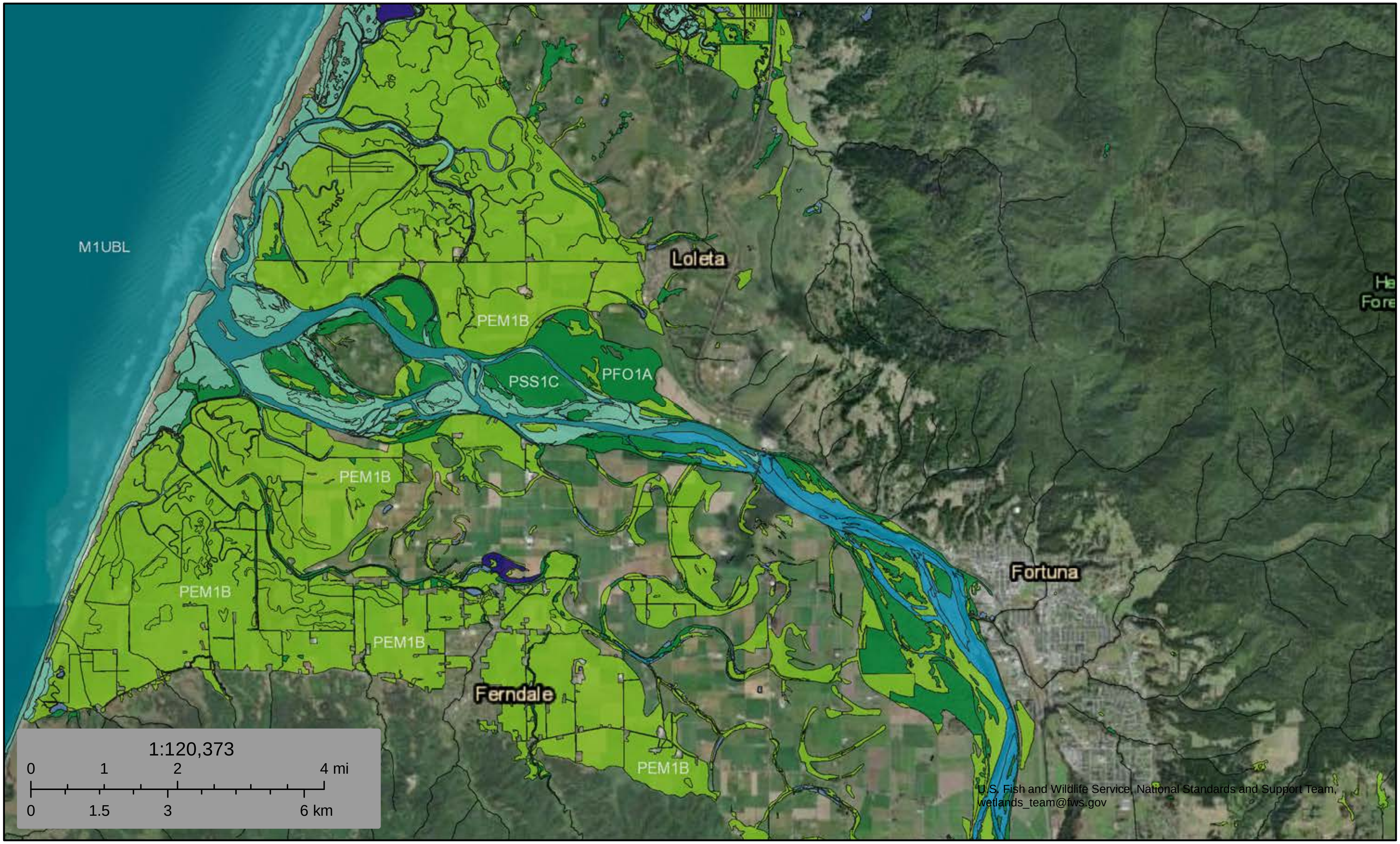
Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

U.S. Fish and Wildlife Service
National Wetlands Inventory

Map 3 - Eel River Estuary Vicinity



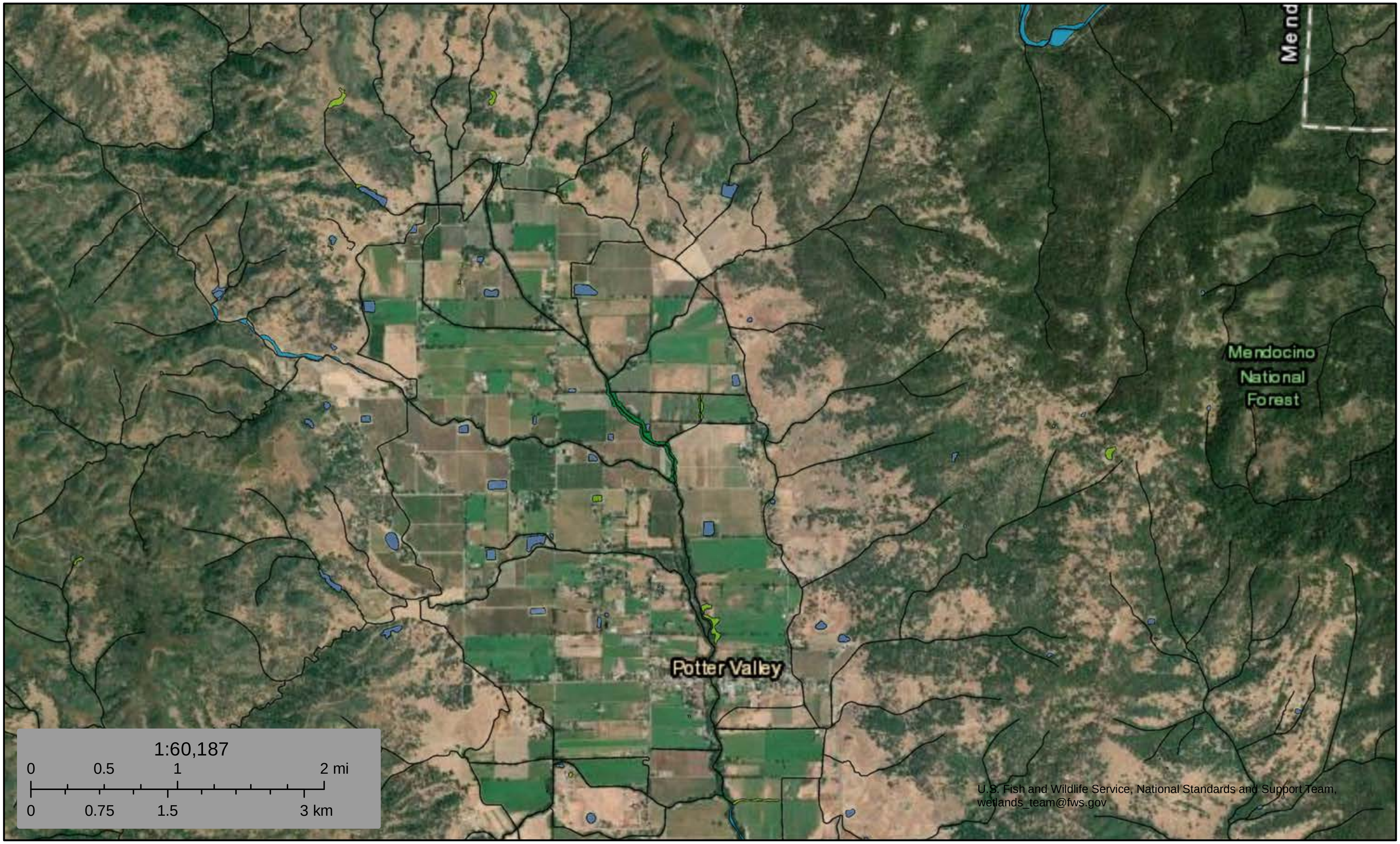
May 24, 2024

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Map 4 - East Branch Russian River Vicinity



May 24, 2024

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Figures

List of Maps

List of Acronyms

BCC	Birds of Conservation Concern
CALVEG	Classification and Assessment with LANDSAT of Visible Ecological Groupings
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFP	California Fully Protected
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
SSC	California Species of Special Concern
CWHR	California Wildlife Habitat Relationships
DPS	Distinct Population Segment
Eagle Act	Bald and Golden Eagle Protection Act
ESA	Endangered Species Act
FC	Federal Candidate
FD	Federally Delisted
FE	Federally Endangered
FERC	Federal Energy Regulatory Commission
FPE	Federally Proposed Endangered
FPT	Federally Proposed Threatened
FSS	Forest Service Sensitive

ft.	foot/feet
FT	Federally Threatened
IPaC	Information for Planning and Consultation
LANDSAT	Land Satellite
MNF	Mendocino National Forest
PG&E	Pacific Gas & Electric Company
Project	Potter Valley Hydroelectric Project
SE	State-listed as Endangered
ST	State-listed as Threatened
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

This Page Intentionally Left Blank

3.3.5 Wildlife Resources

3.3.5.1 Introduction

This section describes the terrestrial wildlife resources in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). The Federal Energy Regulatory Commission (FERC) content requirements for this section are specified in Title 18 of the Code of Federal Regulations (CFR) §5.6(d)(3)(v). In addition, this section describes rare, threatened, and endangered terrestrial wildlife resources in the vicinity of the Project. The FERC content requirements for this information are specified in §5.6(d)(3)(vii). Note that only terrestrial wildlife resources are discussed in this section. Please refer to Section 3.3.3 – Fish and Aquatic Resources for a discussion of aquatic wildlife resources (i.e., fishes, amphibians, and aquatic reptiles).

3.3.5.2 Information Sources

The information presented in this section is primarily based on data from resource agency files, reports, and databases; published literature; and, to a lesser extent, field studies conducted by PG&E in 2018. Existing relevant information reviewed for terrestrial wildlife resources includes the following:

- California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Database (CNDDB) (CNDDB 2024);
- CDFW's 2023 Fishing and Hunting Regulations (CDFW 2024a);
- California Wildlife Habitat Relationships (CWHR) System Database, Version 9.0 (CDFW 2024b);
- *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988);
- Information presented in the TERR 2 – Wildlife Resources Study Data Memorialization, Technical Study Summary (PG&E 2019a);
- PG&E Final Potter Valley Project 2015–2019 Bald Eagle Monitoring Report (PG&E 2019b) and Bald Eagle Nest Territory Forms from 2019 to 2023;
- U.S. Forest Service (USFS) Mendocino National Forest (MNF) Proposed Land and Resource Management Plan (USFS-MNF 1986);
- USFS's Pacific Southwest Region 5 Regional Forester's 2013 Sensitive Animal Species List (USFS 2013);
- USFS's Classification and Assessment with land satellite (LANDSAT) of Visible Ecological Groupings (CALVEG) mapping and vegetation alliance descriptions (USFS 2016a);
- MNF survey data and environmental documents prepared for other projects in the vicinity of the Project (USFS 2024);

- The U.S. Fish and Wildlife Service's (USFWS's) Birds of Conservation Concern (BCC) (USFWS 2021a); and
- USFWS Information for Planning and Consultation (IPaC) website (USFWS 2024).

3.3.5.3 Wildlife Resources

This section describes terrestrial wildlife resources in the Project vicinity, including wildlife habitats, common wildlife species, special-status species, and game species.

The study area for each wildlife resource varies depending on habitat and species. The study area for assessing each wildlife resource component is provided in each section below.

Wildlife Habitats and Associated Common Wildlife Species

Information on wildlife habitats was obtained to characterize habitat conditions and identify common wildlife species in the Project vicinity. Consistent with the study for vegetation alliances (Section 3.3.4 – Botanical Resources), the study area for wildlife habitats and common wildlife species includes two components: (1) areas within 0.5 mile of the FERC Project boundary, and also the Eel River between Scott Dam and Van Arsdale Reservoir) and (2) areas within 0.25 mile of the Eel River from Cape Horn Dam downstream to the Eel River estuary outlet into the Pacific Ocean, as well as the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino.

Wildlife habitats in the study area were determined through use of a "crosswalk" between USFS CALVEG alliances and CDFW's CWHR wildlife habitat classifications. The CALVEG–CWHR crosswalk was developed by USFS and CDFW to identify wildlife habitats likely to be present based on existing vegetation communities and forest structural characteristics. A table showing representative common wildlife species potentially occurring within these habitats was then developed based on a review of *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988) and CDFW's California Wildlife Habitat Relationships System Database, Version 9.0 (CDFW 2024b).

Refer to Table 3.3.5-1 for a list of the wildlife habitats that occur in the study area and Table 3.3.5-2 for a list of representative common wildlife species that are found in the associated CWHR wildlife habitats. Refer to Appendix 3.3.5-A for a description of each CWHR habitat.

Table 3.3.5-1. CALVEG vegetation alliances and associated CWHR wildlife habitats in the study area.

CALVEG Vegetation Alliances	CALVEG Code	CWHR Wildlife Habitats	CWHR Code
Herbaceous Vegetation Communities			
Annual Grasses and Forbs	HG	Annual Grassland	AGS
Pastures and Crop Agriculture	A6	Irrigated Hayfield Crop	IGR
Perennial Grasses and Forbs	HM	Perennial Grassland	PGS
Pickleweed–Cordgrass	HC	Saline Emergent Wetland	SEW
Shrub-Dominated Vegetation Communities			
Chamise	CA	Chamise–Redshank Chaparral	CRC
Salal–California Huckleberry	CB	Coastal Scrub	CSC
Coyote Brush	CK		
North Coast Mixed Shrub	NC		
Blueblossom Ceanothus	SC		
Wedgeleaf Ceanothus	CL	Mixed Chaparral	MCH
Lower Montane Mixed Chaparral	CQ		
Scrub Oak	CS		
Whiteleaf Manzanita	CW		
Manzanita Chaparral	SD		
Birchleaf Mountain Mahogany	WM		
Brewer Oak	CJ	Montane Chaparral	MCP
Upper Montane Mixed Chaparral	CX		
Riparian Mixed Shrub	NM	Montane Riparian	MRI
Willow (Shrub)	WL		
Riparian Mixed Shrub	NM	Valley Foothill Riparian	VRI
Willow (Shrub)	WL		
Tree-Dominated Vegetation Communities			
Gray Pine	PD	Blue Oak–Foothill Pine	BOP
Blue Oak	QD	Blue Oak Woodland	BOW
Coastal Mixed Hardwood	EX	Coastal Oak Woodland	COW
California Bay	QB		
Knobcone Pine	KP	Closed-Cone Pine–Cypress	CPC
Pacific Douglas-Fir	DF	Douglas-Fir	DFR
Eucalyptus	QZ	Eucalyptus	EUC

CALVEG Vegetation Alliances	CALVEG Code	CWHR Wildlife Habitats	CWHR Code
Pacific Douglas-Fir	DF	Montane Hardwood–Conifer	MHC
Douglas-Fir–Ponderosa Pine	DP		
Knobcone Pine	KP		
Mixed Conifer–Pine	MP		
Ponderosa Pine	PP		
Redwood–Douglas-Fir	RD		
Redwood	RW		
Sitka Spruce	SK		
Interior Mixed Hardwood	NX	Montane Hardwood	MHW
California Bay	QB		
Canyon Live Oak	QC		
Oregon White Oak	QG		
Madrone	QH		
Black Oak	QK		
Tanoak (Madrone)	QT		
Interior Live Oak	QW		
Montane Mixed Hardwood	TX		
Riparian Mixed Hardwood	NR	Montane Riparian	MRI
White Alder	QE		
Fremont Cottonwood	QF		
Willow	QO		
Willow–Alder	QY		
Black Cottonwood	QX		
Red Alder	QR		
Ponderosa Pine	PP	Ponderosa Pine	PPN
Redwood–Douglas-Fir	RD	Redwood	RDW
Redwood	RW		
Sitka Spruce	SK		
Valley Oak	QL	Valley Oak Woodland	VOW

CALVEG Vegetation Alliances	CALVEG Code	CWHR Wildlife Habitats	CWHR Code
Aquatic			
Perennial Lake or Pond	W2	Lacustrine	LAC
Reservoir	W3		
Intermittent Lake or Pond	W8		
Beach Sand	OS	Marine	MAR
Ocean	W7		
River/Stream/Canal	W1	Riverine	RIV
High Water Line/Gravel/Sand Bar	W9		
Urban, Agriculture, or Barren			
Barren	BA	Barren	BAR
Dune	DU		
Urban-related Bare Soil	IB		
Agriculture (General)	AG	Cropland	CRP
Urban/Developed (General)	UB	Urban	URB

Note: Consistent with the study for vegetation alliances (Section 3.3.4), the study area for wildlife habitats and common wildlife species includes two components: (1) areas within 0.5 mile of the FERC Project boundary, and also the Eel River between Scott Dam and Van Arsdale Reservoir and (2) areas within 0.25 mile of the Eel River from Cape Horn Dam downstream to the Eel River estuary outlet into the Pacific Ocean, as well as the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino.

This Page Intentionally Left Blank

Table 3.3.5-2. Common terrestrial wildlife species associated with CWHR wildlife habitats in the study area.

Common Wildlife		CWHR Wildlife Habitats																											
		Herbaceous-Dominated Habitats				Shrub-Dominated Habitats						Tree-Dominated Habitats												Aquatic Habitats			Urban, Agriculture, or Barren Habitats		
Common Name	**Scientific Name**	**Annual Grassland**	**Irrigated Hayfield Crop**	**Perennial Grassland**	**Saline Emergent Wetland**	**Chamise-Redshank Chaparral**	**Coastal Scrub**	**Mixed Chaparral**	**Montane Chaparral**	**Montane Riparian**	**Valley Foothill Riparian**	**Blue Oak–Foothill Pine**	**Blue Oak Woodland**	**Coastal Oak Woodland**	**Closed-Cone Pine–Cypress**	**Douglas-Fir**	**Eucalyptus**	**Montane Hardwood–Conifer**	**Montane Hardwood**	**Montane Riparian**	**Ponderosa Pine**	**Redwood**	**Valley Oak Woodland**	**Lacustrine**	**Marine**	**Riverine**	**Barren**	**Cropland**	**Urban**
Terrestrial Reptiles																													
northern/southern alligator lizard	*Elgaria coerulea/multicarinata*	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
California kingsnake	*Lampropeltis californiae*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
western fence lizard	*Sceloporus occidentalis*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
gophersnake	*Pituophis catenifer*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
western rattlesnake	*Crotalus oreganus*	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●		●
Birds																													
pied-billed grebe	*Podilymbus podiceps*				●																			●	●	●			
double-crested cormorant	*Phalacrocorax auritus*				●						●													●	●	●	●		
turkey vulture	*Cathartes aura*	●	●	●		●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Canada goose	*Branta canadensis*	●	●	●	●																			●		●		●	●
northern pintail	*Anas acuta*	●	●	●	●																			●	●	●		●	●
American wigeon	*Anas americana*	●	●	●	●																			●		●		●	●
northern shoveler	*Anas clypeata*	●	●	●	●																			●				●	
cinnamon teal	*Anas cyanoptera*	●	●	●	●						●													●		●		●	
mallard	*Anas platyrhynchos*	●	●	●	●					●	●						●		●					●		●		●	●
lesser scaup	*Aythya affinis*	●	●	●	●																			●	●	●		●	
bufflehead	*Bucephala albeola*				●					●	●									●				●					
ring-necked duck	*Aythya collaris*																							●					
great egret	*Ardea alba*	●	●	●	●					●	●	●	●	●	●	●	●	●		●		●	●	●		●		●	●
great blue heron	*Ardea herodias*	●	●	●	●		●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●

Common Wildlife		CWHR Wildlife Habitats																											
		Herbaceous-Dominated Habitats				Shrub-Dominated Habitats						Tree-Dominated Habitats												Aquatic Habitats			Urban, Agriculture, or Barren Habitats		
Common Name	Scientific Name	Annual Grassland	Irrigated Hayfield Crop	Perennial Grassland	Saline Emergent Wetland	Chamise-Redshank Chaparral	Coastal Scrub	Mixed Chaparral	Montane Chaparral	Montane Riparian	Valley Foothill Riparian	Blue Oak–Foothill Pine	Blue Oak Woodland	Coastal Oak Woodland	Closed-Cone Pine–Cypress	Douglas-Fir	Eucalyptus	Montane Hardwood–Conifer	Montane Hardwood	Montane Riparian	Ponderosa Pine	Redwood	Valley Oak Woodland	Lacustrine	Marine	Riverine	Barren	Cropland	Urban
snowy egret	*Egretta thula*		•		•					•	•						•			•				•		•		•	•
Cooper's hawk	*Accipiter cooperi*	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
red-shouldered hawk	*Buteo lineatus*	•	•	•	•		•			•	•	•	•	•			•	•	•	•		•	•					•	•
red-tailed hawk	*Buteo jamaicensis*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•		•
American kestrel	*Falco sparverius*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•
merlin	*Falco columbarius*	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
ring-neck pheasant	*Phasianus colchicus*	•	•	•				•			•	•					•											•	•
wild turkey	*Meleagris gallopavo*	•	•	•		•	•	•	•	•	•	•	•	•			•	•	•	•	•		•					•	
California quail	*Callipepla californica*	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
mountain quail	*Oreorthyx pictus*	•		•		•	•	•	•	•	•	•		•		•		•	•	•	•	•							
American coot	*Fulica americana*	•	•	•	•																			•		•		•	•
killdeer	*Charadrius vociferus*	•	•	•	•						•	•	•											•	•	•	•	•	•
ring-billed gull	*Larus delawarensis*	•	•	•	•																			•	•	•		•	•
band-tailed pigeon	*Patagioenas fasciata*						•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•					•	•
mourning dove	*Zenaida macroura*	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
barn owl	*Tyto alba*	•	•	•		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•				•	•	•
great horned owl	*Bubo virginianus*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•
Anna's hummingbird	*Calypte anna*					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
belted kingfisher	*Ceryle alcyon*				•					•	•									•		•		•	•	•	•		
acorn woodpecker	*Melanerpes formicivorus*									•	•	•	•	•		•	•	•	•	•	•	•	•						•
red-breasted sapsucker	*Sphyrapicus ruber*					•		•		•	•	•	•	•		•	•	•	•	•	•	•	•					•	•
Nuttall's woodpecker	*Picoides nuttallii*					•	•	•	•	•	•	•	•	•		•	•	•	•	•	•		•						•

Common Wildlife		CWHR Wildlife Habitats																											
		Herbaceous-Dominated Habitats				Shrub-Dominated Habitats						Tree-Dominated Habitats												Aquatic Habitats			Urban, Agriculture, or Barren Habitats		
Common Name	**Scientific Name**	Annual Grassland	Irrigated Hayfield Crop	Perennial Grassland	Saline Emergent Wetland	Chamise-Redshank Chaparral	Coastal Scrub	Mixed Chaparral	Montane Chaparral	Montane Riparian	Valley Foothill Riparian	Blue Oak–Foothill Pine	Blue Oak Woodland	Coastal Oak Woodland	Closed-Cone Pine–Cypress	Douglas-Fir	Eucalyptus	Montane Hardwood–Conifer	Montane Hardwood	Montane Riparian	Ponderosa Pine	Redwood	Valley Oak Woodland	Lacustrine	Marine	Riverine	Barren	Cropland	Urban
downy woodpecker	*Picoides pubescens*	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
northern flicker	*Colaptes auratus*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
pileated woodpecker	*Dryocopus pileatus*									●		●				●		●	●	●	●	●							
Pacific-slope flycatcher	*Empidonax difficilis*						●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
black phoebe	*Sayornis nigricans*	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●			●	●	●	●	●	●
Say’s phoebe	*Sayornis saya*	●	●	●		●		●	●		●	●	●	●			●						●				●		
California scrub-jay	*Aphelocoma californica*		●			●	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●					●	●
Steller’s jay	*Cyanocitta stelleri*							●		●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
American crow	*Corvus americanus*	●	●	●						●	●	●	●	●		●	●	●	●	●	●	●	●	●		●		●	●
common raven	*Corvus corax*	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
tree swallow	*Tachycineta bicolor*	●	●	●	●			●	●	●	●	●	●	●			●	●	●	●	●		●	●		●		●	●
cliff swallow	*Petrochelidon pyrrhonota*	●	●	●	●	●	●	●	●	●	●	●	●				●			●	●	●		●		●		●	●
barn swallow	*Hirundo rustica*	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
oak titmouse	*Baeolophus inornatus*					●		●			●	●	●	●			●	●	●				●					●	●
bushtit	*Pasltriparus minimus*					●	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●						●
red-breasted nuthatch	*Sitta canadensis*									●	●	●	●	●	●	●	●	●	●	●	●	●	●						●
white-breasted nuthatch	*Sitta carolinensis*					●				●	●	●	●	●	●	●	●	●	●	●	●		●						●
brown creeper	*Certhia americana*									●	●	●	●	●	●	●	●	●	●	●	●	●	●						●
Bewick’s wren	*Thryomanes bewickii*					●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●					●	●
ruby-crowned kinglet	*Regulus calendula*		●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
golden-crowned kinglet	*Regulus satrapa*					●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●					●	●
Swainson’s thrush	*Catharus ustulatus*					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●

Common Wildlife		CWHR Wildlife Habitats																											
		Herbaceous-Dominated Habitats				Shrub-Dominated Habitats						Tree-Dominated Habitats												Aquatic Habitats			Urban, Agriculture, or Barren Habitats		
Common Name	**Scientific Name**	**Annual Grassland**	**Irrigated Hayfield Crop**	**Perennial Grassland**	**Saline Emergent Wetland**	**Chamise-Redshank Chaparral**	**Coastal Scrub**	**Mixed Chaparral**	**Montane Chaparral**	**Montane Riparian**	**Valley Foothill Riparian**	**Blue Oak–Foothill Pine**	**Blue Oak Woodland**	**Coastal Oak Woodland**	**Closed-Cone Pine–Cypress**	**Douglas-Fir**	**Eucalyptus**	**Montane Hardwood–Conifer**	**Montane Hardwood**	**Montane Riparian**	**Ponderosa Pine**	**Redwood**	**Valley Oak Woodland**	**Lacustrine**	**Marine**	**Riverine**	**Barren**	**Cropland**	**Urban**
western bluebird	*Sialia mexicana*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
American robin	*Turdus migratorius*	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
American pipit	*Anthus rubescens*	●	●	●	●						●						●							●	●	●	●		●
American dipper	*Cinclus mexicanus*									●	●									●				●		●	●		●
yellow-rumped warbler	*Dendroica coronata*	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
orange-crowned warbler	*Vermivora celata*					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
western tanager	*Piranga ludoviciana*					●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
California towhee	*Melozone crissalis*					●	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●					●	●
spotted towhee	*Pipilo maculatus*					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
lark sparrow	*Chondestes grammacus*	●	●	●		●	●	●			●	●	●	●	●		●	●	●		●		●					●	
savannah sparrow	*Passerculus sandwichensis*	●	●	●	●	●	●	●			●	●	●	●			●						●					●	
golden-crowned sparrow	*Zonotrichia atricapilla*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
white-crowned sparrow	*Zonotrichia leucophrys*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
song sparrow	*Melospiza melodia*	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
dark-eyed junco	*Junco hyemalis*		●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
western meadowlark	*Sturnella neglecta*	●		●		●	●	●			●	●	●	●	●	●	●	●	●		●	●	●					●	●
red-winged blackbird	*Agelaius phoeniceus*	●	●	●	●		●			●	●						●			●			●					●	●
Brewer's blackbird	*Euphagus cyanocephalus*	●	●	●			●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
house finch	*Haemorhous mexicanus*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
lesser goldfinch	*Spinus psaltria*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
American goldfinch	*Spinus tristis*	●	●	●			●	●		●	●	●	●	●	●	●	●	●	●	●		●	●					●	●

Common Wildlife		CWHR Wildlife Habitats																											
		Herbaceous-Dominated Habitats				Shrub-Dominated Habitats						Tree-Dominated Habitats												Aquatic Habitats			Urban, Agriculture, or Barren Habitats		
Common Name	**Scientific Name**	**Annual Grassland**	**Irrigated Hayfield Crop**	**Perennial Grassland**	**Saline Emergent Wetland**	**Chamise-Redshank Chaparral**	**Coastal Scrub**	**Mixed Chaparral**	**Montane Chaparral**	**Montane Riparian**	**Valley Foothill Riparian**	**Blue Oak–Foothill Pine**	**Blue Oak Woodland**	**Coastal Oak Woodland**	**Closed-Cone Pine–Cypress**	**Douglas-Fir**	**Eucalyptus**	**Montane Hardwood–Conifer**	**Montane Hardwood**	**Montane Riparian**	**Ponderosa Pine**	**Redwood**	**Valley Oak Woodland**	**Lacustrine**	**Marine**	**Riverine**	**Barren**	**Cropland**	**Urban**
Mammals																													
California myotis	*Myotis californicus*	•	•	•		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•		•	•	•	•
long-eared myotis	*Myotis evotis*		•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	
little brown myotis	*Myotis lucifugus*	•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•		•
Yuma myotis	*Myotis yumanensis*	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•		•	•
western pipistrelle	*Parastrellus hesperus*	•	•	•		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•		•			•	•	•	•
Brazilian free-tailed bat	*Tadarida brasiliensis*	•	•	•		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•			•	•	•	•
black-tailed jackrabbit	*Lepus californica*	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
deer mouse	*Peromyscus* spp.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•
Douglas' squirrel	*Tamiasciurus douglasii*									•						•		•	•	•	•	•						•	
western gray squirrel	*Sciurus griseus*							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
California ground squirrel	*Otospermophilus beecheyi*	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•
American beaver	*Castor canadensis*	•		•					•	•	•		•	•				•		•			•	•		•			
coyote	*Canis latrans*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•
gray fox	*Urocyon cinereoargenteus*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
black bear	*Ursus americanus*	•	•	•		•	•	•	•	•	•	•				•		•	•	•	•	•		•		•		•	
river otter	*Lontra canadensis*				•						•													•	•	•			
raccoon	*Procyon lotor*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•
striped skunk	*Mephitis mephitis*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•
bobcat	*Lynx rufus*	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	
mountain lion	*Puma concolor*	•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	

Common Wildlife		CWHR Wildlife Habitats																											
		Herbaceous-Dominated Habitats				Shrub-Dominated Habitats						Tree-Dominated Habitats												Aquatic Habitats			Urban, Agriculture, or Barren Habitats		
Common Name	**Scientific Name**	**Annual Grassland**	**Irrigated Hayfield Crop**	**Perennial Grassland**	**Saline Emergent Wetland**	**Chamise-Redshank Chaparral**	**Coastal Scrub**	**Mixed Chaparral**	**Montane Chaparral**	**Montane Riparian**	**Valley Foothill Riparian**	**Blue Oak–Foothill Pine**	**Blue Oak Woodland**	**Coastal Oak Woodland**	**Closed-Cone Pine–Cypress**	**Douglas-Fir**	**Eucalyptus**	**Montane Hardwood–Conifer**	**Montane Hardwood**	**Montane Riparian**	**Ponderosa Pine**	**Redwood**	**Valley Oak Woodland**	**Lacustrine**	**Marine**	**Riverine**	**Barren**	**Cropland**	**Urban**
black-tailed deer	*Odocoileus hemionus*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	●
Tule elk	*Cervus elaphus nannodes*	●	●	●			●	●		●	●	●	●	●		●	●	●	●	●		●	●					●	●
wild pig	*Sus scrofa*	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					●	

Note: Consistent with the study for vegetation alliances (Section 3.3.4), the study area for wildlife habitats and common wildlife species includes two components: (1) areas within 0.5 mile of the FERC Project boundary, and also the Eel River between Scott Dam and Van Arsdale Reservoir and (2) areas within 0.25 mile of the Eel River from Cape Horn Dam downstream to the Eel River estuary outlet into the Pacific Ocean, as well as the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino.

Special-Status Wildlife

This section describes special-status terrestrial wildlife that occur or may potentially occur in the vicinity of the Project. The study area for special-status terrestrial wildlife species includes (1) areas within 1 mile of the FERC Project boundary, and also the Eel River between Scott Dam and Van Arsdale Reservoir), (2) areas within a 0.5 mile buffer area from Cape Horn Dam downstream to the Middle Fork Eel River, as well as the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino, and (3) areas within 0.25 mile of the Eel River from its confluence with the Middle Fork Eel River downstream to the Eel River estuary outlet into the Pacific Ocean. The 1-mile buffer around the FERC Project boundary and the Eel River between Scott Dam and Van Arsdale Reservoir was chosen to provide a broad perspective according to the maximum potential disturbance buffers used to protect terrestrial wildlife species from disturbance during construction. The 0.5 and 0.25-mile buffer was chosen to identify any species potentially using riparian habitats along the Eel River corridor and the Eel River estuary, as well as the East Branch Russian River. Additional species-specific study areas are defined where applicable. This section addresses only special-status terrestrial wildlife species. Special-status aquatic species, including fishes, amphibians, and aquatic reptiles, are addressed in Section 3.3.3 – Fish and Aquatic Resources, and special-status botanical species are addressed in Section 3.3.4 – Botanical Resources.

For the purposes of this document, a special-status wildlife species is defined as any animal species that is granted status by a federal, state, or local agency. Federally listed species granted status by USFWS under the Endangered Species Act (ESA) are those that are federally listed as endangered (FE), federally listed as threatened (FT), federally proposed endangered (FPE), federally proposed threatened (FPT), federal candidate (FC), or federally delisted (FD). Bald and golden eagles are protected by the USFWS under the Bald and Golden Eagle Protection Act (Eagle Act). The definition also includes species designated by USFS as Forest Service Sensitive (FSS).

Also included are those species listed by USFWS as BCC, which include “species, subspecies, and populations of all migratory non-game birds that, without additional conservation action, are likely to become candidates for listing under the ESA of 1973” (USFWS 2021).

State of California–listed wildlife species that are granted status by CDFW under the California Endangered Species Act (CESA) include those that are state-listed as endangered (SE), state-listed as threatened (ST), California fully protected (CFP), and California Species of Special Concern (SSC).

A comprehensive list of special-status wildlife species was compiled from the following sources:

- CDFW’s State and Federally Listed Endangered and Threatened Animals of California (CDFW 2024c) was reviewed to generate a list of state-listed species potentially occurring in the Project vicinity. Only those state-listed wildlife species on the list whose range overlaps the Project vicinity were included.

- List of species considered CFP under the California Fish and Game Code (Sections 3511, 4700, 5050, and 5515) (CDFW 2024d). Only those wildlife species on the list whose range overlaps the Project vicinity were included.
- The USFWS IPaC website was queried to generate a list of federally endangered and threatened species that occur or may potentially occur in the Project vicinity (USFWS 2024).
- USFWS's BCC (USFWS 2021a) was reviewed to obtain a list of BCC in the study area. The Project is within Bird Conservation Region 32 (Coastal California). Therefore, representative BCC within this region were included.
- USFS's Pacific Southwest Region 5 Regional Forester's 2013 Sensitive Animal Species List (USFS 2013).

This comprehensive list was then evaluated to determine which wildlife species occur or may potentially occur in the Project vicinity based on review of the following:

- A query of the CNDDB (2024) to obtain information on known occurrences in the Project vicinity;
- Wildlife observation data obtained from the MNF (USFS 2016b);
- Wildlife observations from technical studies conducted in the Project area in 2018 (PG&E 2019a); and
- The geographic location and elevation of the Project, associated vegetation alliances, and other habitat features present.

Wildlife species on the list were then categorized as follows:

- **Known to occur in the study area:** Wildlife species with recorded occurrences in the Project vicinity, as determined by the CNDDB, MNF records, or observations made during studies conducted in 2018 (PG&E 2019).
- **May potentially occur in the study area:** Wildlife species that "may potentially occur" in the Project vicinity based on the geographic location and elevation of the Project and wildlife habitats present.
- **Unlikely to occur in the study area:** Wildlife species that are "unlikely to occur" because their range does not overlap the study area or for which the study area does not support appropriate habitat.

Refer to Table 3.3.5-3 for the list of special-status terrestrial wildlife species evaluated for their potential to occur in the study area, as well as a summary of pertinent information for each species, including status and preferred habitat, with information on the location of the occurrence, if applicable. Potential for occurrence was categorized into separate geographic areas, including Scott Dam Area (Scott Dam, Lake Pillsbury, and associated Project facilities and Project recreation facilities), Cape Horn Dam Area (Cape Horn Dam, Van Arsdale Reservoir, Potter Valley

Powerhouse, and associated Project facilities), Eel River to the ocean, and the East Branch Russian River to Lake Mendocino. Confidential Maps 3.3.5-1a through 3.3.5-1i[1] show the results of the CNDDB query and literature search conducted for the study area.

A total of 18 special-status wildlife species are known to occur or may potentially occur across the entire study area: western bumble bee (*Bombus occidentalis*) (FSS, SCE), northern goshawk (American goshawk) (*Accipiter gentilis [=A. atricapillus]*) (FSS, SSC), tricolored blackbird (*Agelaius tricolor*) (BCC, ST, SSC), grasshopper sparrow (*Ammodramus savannarum*) (SSC), golden eagle (*Aquila chrysaetos*) (Eagle Act, CFP), marbled murrelet (*Brachyramphus marmoratus*) (FT, SE), American peregrine falcon (*Falco peregrinus anatum*) (FD, SD, CFP), bald eagle (*Haliaeetus leucocephalus*) (FD, Eagle Act, FSS, SE, CFP), bank swallow (*Riparia riparia*) (ST), yellow warbler (*Setophaga petechia*) (SSC), northern spotted owl (*Strix occidentalis caurina*) (FT, FSS, ST, SSC), pallid bat (*Antrozous pallidus*) (FSS, SSC), Sonoma tree vole (*Arborimus pomo*) (SSC), Townsend's big-eared bat (*Corynorhinus townsendii*) (FSS, SSC), western mastiff bat (*Eumops perotis californicus*), western red bat (*Lasiurus blossevillii*) (SSC), fringed myotis (*Myotis thysanodes*) (FSS), and the West Coast Distinct Population Segment (DPS) of fisher (*Pekania pennanti)* (FSS, SSC).

Other bird species protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code may also occur in the area. Osprey (*Pandion haliaetus*), which is a CDFW watchlist species, was observed throughout the study area during studies conducted in 2018 (PG&E 2019a).

Three special-status wildlife species are known to occur only in the vicinity of the Eel River estuary, including the western snowy plover (*Charadrius nivosus nivosus*) (FT, SSC), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (FT, SE), and yellow rail (*Coturnicops noveboracensis*) (SSC).

Nine additional species have not been documented in the study area but have the potential to occur based on geographic location and elevation of the Project and wildlife habitats present (Table 3.3.5-3).

The remaining species listed on Table 3.3.5-3 are considered unlikely to occur, either because the Project is outside the known range of the species and/or the study area does not support appropriate habitat.

In 2018, PG&E conducted several studies to assess occupancy and/or habitat suitability for bald eagle, northern spotted owl, northern goshawk, fisher – West Coast DPS, Pacific marten (*Martes caurina*), and special-status bats. The studies and relevant conclusions are summarized below.

[1] Confidential maps are provided in Volume III.

This Page Intentionally Left Blank

Table 3.3.5-3. Special-status terrestrial wildlife species known to occur in the study area.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
KNOWN TO OCCUR IN THE STUDY AREA									
Insects									
Bombus occidentalis	western bumble bee	—	FSS	SSC	The historical range of the western bumble bee includes most of western North America. This species has general habitat requirements and is not dependent on any specific flower species for food.	**May potentially occur.** • Within geographic range of the species and supports appropriate habitat (i.e., floral resources).	**May potentially occur.** • Within geographic range of the species and supports appropriate habitat (i.e., floral resources).	**Known to occur.** • Within geographic range of the species and supports appropriate habitat (i.e., floral resources) • There are four records for this species along the Eel River in this portion of the study area.	**May potentially occur.** • Within geographic range of the species and supports appropriate habitat (i.e., floral resources)
Birds									
Accipiter gentilis (=A. atricapillus)	northern (American) goshawk	—	FSS	SSC	Most common between elevations of 3,500 feet and 7,500 feet, typically breed in mixed-age coniferous and hardwood stands with an old-growth component, and forage along edge habitats (e.g., margins of meadows and/or peripheries of water bodies). Casual in foothills during winter, northern deserts in pinyon-juniper woodland, and low-elevation riparian habitats.	**Known to occur.** • Within geographic range of the species. • Mixed conifer, Douglas fir – Ponderosa pine, and mixed hardwood forests surrounding Scott Dam and along the west shore of Lake Pillsbury provide suitable nesting and foraging habitat. • Historical records include four occurrences of northern (American) goshawk within a 1-mile buffer of the FERC boundary and Project-affected reaches (USFS 2016).	**May potentially occur.** • Within the geographic range of this species. • Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat.	**May potentially occur.** • Within the geographic range of this species. • Redwood, Pacific Douglas-fir, redwood Douglas-fir forests located along both banks of the Eel River provide suitable nesting and foraging habitat.	**May potentially occur.** • Within the geographic range of this species. • Gray pine and interior mixed hardwood along portions of the East Branch Russian River provide suitable nesting and foraging habitat.
Agelaius tricolor	tricolored blackbird	BCC	—	ST, SSC	Tricolored blackbirds nest in dense colonies in large freshwater marshes among cattails, bulrush, and tule stands. Foraging occurs in croplands, fields, and other irrigated habitats.	**May potentially occur.** • Within geographic range of the species. • Emergent wetlands on the north shore of Lake Pillsbury provides suitable habitat.	**May potentially occur.** • Within geographic range of the species. • The south side of Van Arsdale Reservoir supports two small emergent wetlands that provide suitable habitat.	**May potentially occur.** • Within geographic range of the species. • Grasslands, prairie lands, agricultural lands, and marshes along both banks of the Eel River represent suitable nesting and foraging habitat for this species. •	**Known to occur.** • Within geographic range of the species. • Cropland, agricultural land, and pasture lands located along the East Branch Russian River provide suitable nesting and foraging habitat. • There are two recorded occurrences along the East Branch Russian River (CNDDB 2024).

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Ammodramus savannarum	grasshopper sparrow	—	—	SSC	Found in dry, dense grasslands with a variety of grasses and tall vegetation. In California, they are typically found on hillsides and mesas in coastal districts but have extended up to 5,000 feet in elevation.	**May potentially occur.** • Within geographic range of the species. • Grasslands west of Scott Dam provide suitable habitat and lies within the geographic range of this species.	**May potentially occur.** • Within geographic range of the species. • Grasslands north of Cape Horn Dam and bordering the south shore of Van Arsdale Reservoir provide suitable habitat. • Grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley provide suitable foraging habitat.	**Known to occur.** • Within geographic range of the species. • Grasslands and agricultural areas along both banks of the Eel River downstream of Van Arsdale Reservoir represent suitable nesting and foraging habitat. • Two individuals were observed in 2017 near the Eel River estuary (CNDDB 2024).	**May potentially occur.** • Within geographic range of the species. • There is suitable habitat along the East Branch Russian River in the grasslands, agricultural lands, and pasturelands.
Aquila chrysaetos	golden eagle	Eagle Act	—	CFP	Forages in grasslands and early successional stages of forest and shrub habitats at elevations up to 11,500 feet. Nests on secluded cliffs with overhanging ledges or large trees in open areas with unobstructed view.	**May potentially occur.** • Within geographic range of the species. • Open grasslands and chapparal north of Scott Dam provide suitable foraging habitat for this species. • Adjacent cliffs or large trees may provide nesting habitat.	**May potentially occur.** • Within geographic range of the species. • Grasslands to the north of Cape Horn Dam and bordering the south shore of Van Arsdale Reservoir provide suitable foraging habitat. • Grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley Powerhouse provide suitable foraging habitat. • Adjacent cliffs or large trees may provide nesting habitat.	**Known to occur.** • Within geographic range of the species. • An active nest was found in 2003 along the Eel River in this portion of the study area (CNDDB 2024). • Patches of open grasslands within these forests may provide suitable nesting habitat. and agricultural areas along both banks of the Eel River provide foraging habitat for this species. • Adjacent cliffs or large trees may provide nesting habitat.	**May potentially occur.** • Within geographic range of the species. • The study area lies within the geographic range of this species. • Patches of open grasslands within these forests along the river may provide suitable foraging habitat. • Adjacent cliffs or large trees may provide nesting habitat.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Brachyramphus marmoratus	marbled murrelet	FT	—	SE	Marbled murrelets spend most of their time on the ocean but come inland to nest. They generally nest in old-growth forests characterized by large trees, multiple canopy layers, and moderate- to high-canopy cover density. In California, this species is typically found within 25 miles of the coast (USFWS 2016).	**Unlikely to occur.** • This portion of the study area is more than 25 miles from the coast, outside the typical dispersal range for this species. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.	**Unlikely to occur.** • This portion of the study area is more than 25 miles from the coast, outside the typical dispersal range for this species. USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.	**Known to occur.** • Within geographic range of the species. • USFWS has designated Critical Habitat for this species along the lower Eel River in this portion of the study area (USFWS 2016). • Redwood, Pacific Douglas fir, redwood – Douglas fir forests located along both banks of the Eel River provide suitable nesting and foraging habitat. • Two historical occurrences were recorded along the lower portion of the Eel River and around the Eel River estuary. The most recent detection was in 1995 (CNDDB 2024).	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain suitable forest habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.
Charadrius nivosus nivosus	western snowy plover	FT	—	SSC	Found in beaches; dry mud or salt flats; and sandy shores of rivers, lakes, and ponds. Nests are made on the ground on broad open beaches or salt or dry mud flats where vegetation is sparse.	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain beach habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain beach habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.	**Known to occur.** • Within geographic range of the species. • This portion of the study area overlaps with USFWS-designated Critical Habitat for western snowy plover. • The beaches and dunes located in the estuary as well as sandy barren areas along the bank of the Eel River provide suitable nesting habitat • Historic nesting sites are known in the Eel River estuary, with seven nests found in 2014 (CNDDB 2024).	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain beach habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Coccyzus americanus occidentalis	western yellow-billed cuckoo	FT	—	SE	Breeds and forages in riparian areas with low woody vegetation in lowland California, especially willow-cottonwood habitat. This species requires large tracts of willow-cottonwood or mesquite forest or woodland for their nesting season habitat. Western yellow-billed cuckoos rarely nest at sites less than 50 acres in size, and sites less than 37 acres are considered unsuitable habitat.	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain large tracts of suitable riparian habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain large tracts of suitable riparian habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.	**Known to occur.** • Within geographic range of the species. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area. • Large stands of riparian woodlands, Fremont cottonwood stands, and willows located along the banks of the Eel River provide suitable nesting and foraging habitat. • Historic nesting sites are known in the Eel River estuary, with two birds found in 2010 (CNDDB 2024).	**Unlikely to occur.** • Within geographic range of the species – however, this portion of the study area does not contain large tracts of suitable riparian habitat. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.
Coturnicops noveboracensis	yellow rail	—	—	SSC	Found in emergent wetlands, grass or sedge marshes and wet meadows. Winters in freshwater and brackish marshes with deep, dense grass.	**Unlikely to occur.** • Outside the geographic range for this species.	**Unlikely to occur.** • Outside the geographic range for this species. species.	**Known to occur.** • Within geographic range of the species. • Eel River estuary provides suitable nesting and foraging habitat. • There is one record of the species within the Eel River estuary, with the most recent observation in 2013 (CNDDB 2024).	**Unlikely to occur.** • Outside the geographic range for this species.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Falco peregrinus anatum	American peregrine falcon	FD	—	SD, CFP	Very uncommon breeding resident and uncommon as a migrant. Breeds in woodlands, forests, coastal habitats, and riparian areas near wetlands, lakes, rivers, or other water on high cliffs, banks, dunes, or mounds. Active nesting sites are known along the coast, in the Sierra Nevada, and in the mountains of Northern California.	**Known to occur.** • Within geographic range of species. • Forested wetlands to the west and north of Scott Dam, Douglas fir – ponderosa pine forests southwest of Scott Dam, and riparian mixed hardwood forests northwest of Scott Dam provide suitable habitat. • A pair of peregrine falcons was observed soaring at Upper Lake Pillsbury by Sunset Campground during surveys conducted for the relicensing in 2018.	**May potentially occur.** • Within geographic range of the species. • Pacific Douglas fir, Douglas fir – ponderosa pine, and black oak forests to the east of Cape Horn Dam provide suitable nesting habitat. • In addition, there is one historical MNF observation record for this species along the Eel River between Cape Horn Dam and Van Arsdale Reservoir in this area (USFS 2016).	**Known to occur.** • Within geographic range of the species. • Redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River provide suitable nesting and foraging habitat. • There are four known nesting sites along the Eel River and near the Eel River estuary, with active nests found in 2021 (CNDDB 2024).	**May potentially occur.** • Within geographic range of the species. • Coastal mixed hardwood, gray pine, interior live oak, and Oregon white oak forests near the confluence of Lake Mendocino and the East Branch Russian River provide suitable nesting habitat.
Haliaeetus leucocephalus	bald eagle	FD, Eagle Act	FSS	SE, CFP	Year-round resident in ice-free regions of California. Foraging areas include regulated and unregulated rivers, reservoirs, lakes, estuaries, and coastal marine ecosystems. The majority of bald eagles in California breed near reservoirs, and nests are usually located within 1 mile of foraging habitat.	**Known to occur.** • Within geographic range of species. • Lake Pillsbury provides suitable foraging habitat. • Suitable large trees and snags within 1 mile of Lake Pillsbury may provide nesting structures for bald eagles. • PG&E conducts annual monitoring of bald eagles as required by the current license. Monitoring surveys have identified six active territories at Lake Pillsbury. • Bald eagle adults and juveniles were observed perching and foraging during surveys conducted in the study area in 2018 (PG&E 2019a). • There is one CNDDB record along the Eel River outlet into Lake Pillsbury (CNDDB 2024).	**Known to occur.** • Within geographic range of species. • Van Arsdale Reservoir provides suitable foraging habitat. • Suitable large trees and snags within 1 mile of the reservoir may provide nesting structures for bald eagles. • PG&E conducts annual monitoring of bald eagles as required by the current license. Monitoring surveys have identified one active territory at Van Arsdale Reservoir. • Bald eagle adults and juveniles were observed perching and foraging during surveys conducted in the study area in 2018 (PG&E 2019a). • There is one CNDDB record from 2007 near Van Arsdale Reservoir on the Eel River.	**Known to occur.** • Within geographic range of species. • The Eel River and estuary provides suitable aquatic foraging habitat • Suitable large trees and snags within 1 mile of aquatic foraging habitat on the Eel River and estuary may provide nesting structures for bald eagles.	**May potentially occur.** • Within geographic range of species. • The East Branch Russian River provides suitable aquatic foraging habitat. • Suitable large trees and snags within 1 mile of aquatic foraging habitat may provide nesting structures for bald eagles.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Pandion haliaetus	osprey	—	—	WL	Migratory raptor that builds large perennial nests in dead trees or other prominent supports near open water. Foraging areas include regulated and unregulated rivers, reservoirs, lakes, estuaries, and coastal marine ecosystems.	**Known to occur.** • Within geographic range of species. • Lake Pillsbury provides suitable foraging habitat. • Suitable large trees and snags in close proximity to Lake Pillsbury may provide nesting structures. • This species was observed foraging and nesting at Lake Pillsbury during bald eagle monitoring required under the current license. • An individual was observed flying near the Pogie Point Day Use Area during surveys conducted in 2018 (PG&E 2019a). • In addition, there is one CNDDB records from 2004 in this portion of the study area (CNDDB 2024).	**Known to occur.** • Within geographic range of species. • Van Arsdale Reservoir provides suitable foraging habitat. • Suitable large trees and snags in close proximity to Van Arsdale reservoir may provide nesting structures. • In addition, there is one CNDDB record from this portion of the study area (CNDDB 2024). •	**Known to occur.** • Within geographic range of species. • The Eel River and estuary provide suitable aquatic foraging habitat • Suitable large trees and snags in close proximity to the Eel River and estuary may provide nesting structures. • There are multiple records of osprey nests along the Eel River in this portion of the study area (CNDDB 2024).	**Known to occur.** • Within geographic range of species. • The East Branch Russian River provides suitable aquatic foraging habitat. • Suitable large trees and snags in close proximity to aquatic foraging habitat may provide nesting structures for bald eagles •

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Riparia riparia	bank swallow	—	—	ST	Found near rivers, ponds, lakes, and the ocean. Requires grasslands and shrublands for feeding as well as open riparian areas for breeding. Nests in cliffs and riverbanks with fine textured sandy soils.	**May potentially occur.** • Within geographic range of species. • Grasslands and chapparal to the west of Scott Dam provide suitable foraging habitat. Emergent wetland habitat on the north shore of Lake Pillsbury provides suitable foraging habitat.	**May potentially occur.** • Within geographic range of species. • Grasslands to the north of Cape Horn Dam and bordering the south shore of Van Arsdale Reservoir provide suitable foraging habitat. Grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley Powerhouse provide suitable foraging habitat. • The south side of Van Arsdale Reservoir supports two small emergent wetlands that provide suitable foraging habitat.	**Known to occur.** • Within geographic range of species. • Grasslands, prairies, and agricultural areas along both banks of the Eel River downstream of Van Arsdale Reservoir provide foraging habitat for this species. • Wet meadows and riparian areas along both banks of the Eel River from Arsdale Reservoir to the tributaries of the western most portion of the study area provide suitable nesting and breeding habitat. • There are five known occurrences in this portion of the study area (CNDDB 2024). The most recent occurrence was in 2022 where 100 individuals and 600 burrows were found along the bank of the Eel River (CNDDB 2024).	**May potentially occur.** • Within geographic range of species. • Grasslands and shrublands located along the East Branch Russian River provide suitable nesting and foraging habitat for this species.
Setophaga petechia	yellow warbler	—	—	SSC	Breeds in riparian woodlands from coastal and desert lowlands at elevations up to 8,000 feet in the Sierra Nevada. Also breeds in montane chaparral, open ponderosa pine, and mixed conifer habitats with substantial amounts of brush.	**Known to occur.** • Within geographic range of species. • During relicensing surveys conducted in 2018, this species was observed feeding a juvenile brown-headed cowbird (*Molothrus ater*) at the Pillsbury Pines Day Use Area. • Riparian mixed hardwood forests to the northwest of Scott Dam provides suitable nesting habitat. Douglas fir –ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury, as well as southwest of Scott Dam, provide suitable habitat. Additionally, the montane mixed hardwood and conifer forests and chapparal surrounding Lake Pillsbury provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • Forested wetlands identified southeast of Cape Horn Dam along the shore of Van Arsdale Reservoir provide suitable breeding habitat. Pacific Douglas fir, Douglas fir – ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. Patches of open grasslands within these forests may provide suitable nesting habitat. Additionally, the montane mixed chapparal to the southwest of Cape Horn Dam may provide suitable nesting habitat.	**May potentially occur.** • Within geographic range of species. • Riparian mixed hardwood forests, mixed conifer forests, montane mixed chapparal, ponderosa pine forests, scrub oak, and gray pine areas along both banks of the Eel River downstream of Van Arsdale Reservoir provide nesting and foraging habitat for this species.	**May potentially occur.** • Within geographic range of species. • Riparian woodland located along the East Branch Russian River provide suitable nesting and foraging habitat for this species.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Strix occidentalis caurina	northern spotted owl	FT	FSS	ST, SSC	Dense, old-growth, multilayered mixed conifer, redwood, Douglas-fir, and oak woodland habitats, from sea level to elevations of approximately 7,600 feet.	**Known to occur.** • Within geographic range of species. • Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable habitat. Additionally, the montane mixed hardwood and conifer forests surrounding Lake Pillsbury provide suitable habitat. • There is USFWS-designated Critical Habitat for the northern spotted owl within 1 mile of Scott Dam and Trout Creek Group Campground in this portion of the study area, but there is no designated Critical Habitat within the FERC Project boundary (USFWS 2012). • Historical records include multiple historical occurrences of northern spotted owl within a 1-mile buffer of the FERC boundary and Project-affected reaches (USFS 2023 and CNDDB 2024). • There are two known northern spotted owl pairs that have been observed within 2 miles of Scott Dam since the fires in 2018 (USFS 2024). There is also one historic nest location within 2 miles of Scott Dam along the Eel River (CNDDB 2024). There are multiple designated activity centers within 1 mile of Scott Dam.	**Known to occur.** • Within geographic range of species. • Pacific Douglas fir, Douglas fir – ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. • There is no designated Critical Habitat (USFWS 2012) and no designated activity centers in this portion of the study area.	**Known to occur.** • Within geographic range of species. • Redwood, Pacific Douglas fir, grand fir, sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable nesting and foraging habitat. • This portion of the study area overlaps with USFWS-designated Critical Habitat for the northern spotted owl. • There is 1 confirmed nesting location since 2018 within this portion of the study area (CNDDB 2024).	**Unlikely to occur.** • Within geographic range of species, however, this portion of the study area does not contain suitable old-growth forest habitat for this species. • USFWS has designated Critical Habitat for this species; however, there is no Critical Habitat in this portion of the study area.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Mammals									
Antrozous pallidus	pallid bat	—	FSS	SSC	Inhabits a variety of habitats, including coniferous forests. Rock outcroppings, caves, buildings, and bridges are used for roost sites. Pallid bats are year-round residents that hibernate during the winter months.	**Known to occur.** • Within geographic range of species. • Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable habitat. Additionally, the montane mixed conifer forests surrounding Lake Pillsbury provide suitable habitat. Buildings and bridges adjacent to Scott Dam and around Lake Pillsbury provide suitable roosting habitat. • This species was identified through acoustic detection during surveys conducted in 2018 at the Fuller Grove, Navy Camp, Oak Flat, Pillsbury Pines, Pogie Point, and Sunset Point campgrounds as well as at Scott Dam (PG&E 2019a).	**Known to occur.** • Within geographic range of species. • Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. Buildings and bridges adjacent to Cape Horn Dam, Van Arsdale reservoir, and the Potter Valley Powerhouse provide suitable roosting habitat. • This species was identified through acoustic detection during surveys conducted in 2018 at Conduit No. 1 and 2 in the Potter Valley Powerhouse area, Potter Valley Powerhouse building, Potter Valley Powerhouse cabana outbuilding, Van Arsdale Fish Screen Facility, and the Van Arsdale Tunnel No. 1 Gage Shaft (PG&E 2019a).	**Known to occur.** • Within geographic range of species. • Redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, gray pine, knobcone pine forests located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable habitat. Buildings, bridges, and rock outcroppings adjacent to the Eel River and around the estuary provide suitable roosting habitat. • There is a CNDDB record from 2004 near the Eel River (CNDDB 2024).	**May potentially occur.** • Within geographic range of species. • Douglas fir – ponderosa pine, gray pine, and Pacific Douglas fir forests along the East Branch Russian River provide suitable habitat. Buildings, bridges, and rock outcroppings along the East Branch Russian River provide suitable roosting habitat.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Arborimus pomo	Sonoma tree vole	—	—	SSC	Distributed along the North Coast from Sonoma County north to the Oregon border, being more or less restricted to the fog belt. Occurs in old-growth and other forests, mainly Douglas-fir, redwood, and montane hardwood-conifer habitats. Individuals are mostly restricted to stands of old-growth trees and have small territory sizes (Adams and Hayes 1998, Foresman et al. 2016).	**May potentially occur.** • Within geographic range of species. • Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable habitat. Additionally, the montane mixed conifer and hardwood forests surrounding Lake Pillsbury provide suitable habitat. • Unlikely to occur in immediate construction work, access, staging, and stockpile areas as this species is restricted to old-growth.	**Known to occur.** • Within geographic range of species. • Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. Buildings and bridges adjacent to Cape Horn Dam, Van Arsdale reservoir, and the Potter Valley Powerhouse provide suitable habitat. • There is a historical CNDDB record from 2000 near Van Arsdale Reservoir (CNDDB 2024). The study area supports appropriate habitat and lies within the geographic range of this species. • Unlikely to occur in immediate construction work, access, staging, and stockpile areas as this species is restricted to old-growth.	**May potentially occur.** • Within geographic range of species. • Redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable habitat. • There are two known occurrences of this species along the Eel River (CNDDB 2024).	**Unlikely to occur.** • While within the geographic range of the species, this portion of the study area does not contain suitable habitat for this species.
Corynorhinus townsendii	Townsend's big-eared bat	—	FSS	SSC	Found in all but alpine and subalpine habitats; most abundant in mesic habitats. Year-round residents that hibernate from October through April. Requires caves, mines, or human-made structures for roosting. This species is extremely sensitive to disturbance and may abandon a roost if disturbed.	**Known to occur.** • This species was acoustically detected during surveys conducted in 2018 at the Fuller Grove, Navy Camp, Oak Flat, Pillsbury Pines, Pogie Point, and Sunset Point campgrounds as well as at Scott Dam (PG&E 2019a). • Buildings and bridges adjacent to Scott Dam and around Lake Pillsbury provide suitable roosting habitat.	**Known to occur.** • This species was acoustically detected during surveys conducted in 2018 Conduit No. 1 and 2 in the Potter Valley Powerhouse area, Potter Valley Powerhouse cabana outbuilding, Van Arsdale Fish Screen Facility, and the Van Arsdale Tunnel No. 1 Gage Shaft (PG&E 2019a). • Buildings and bridges adjacent to Cape Horn Dam, Van Arsdale reservoir, and the Potter Valley Powerhouse provide suitable roosting habitat.	**Known to occur.** • There are two known occurrences of this species along the Eel River in this portion of the study area (CNDDB 2024). • Buildings, bridges, and rock outcroppings adjacent to the Eel River and around the estuary provide suitable roosting habitat.	**May potentially occur.** • The Douglas fir – ponderosa pine, gray pine, and Pacific Douglas fir forests surrounding Lake Mendocino and along the East Branch Russian River provide suitable habitat. Buildings, bridges, and rock outcroppings along the East Branch Russian River provide suitable roosting habitat.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Eumops perotis californicus	western mastiff bat	—	—	SSC	Found in a variety of habitats including desert scrub, chaparral, oak woodland, ponderosa pine, meadows, and mixed conifer forests up to 4,600 feet in elevation. Distribution is likely limited by availability of significant rock features offering suitable roosting habitat.	**Known to occur.** • This species was acoustically detected during surveys conducted in 2018 at the Pogie Point campground and day use area (PG&E 2019a). • The Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable habitat. Additionally, the montane mixed conifer and hardwood forests and chapparal surrounding Lake Pillsbury provide suitable habitat.	**Known to occur.** • This species was acoustically detected during surveys conducted in 2018 at the Conduit No. 1 in the Potter Valley Powerhouse area (PG&E 2019a). • The Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. Additionally, the montane mixed chapparal to the southwest of Cape Horn Dam may provide suitable habitat. Buildings and bridges adjacent to Cape Horn Dam, Van Arsdale reservoir, and the Potter Valley Powerhouse provide suitable roosting habitat.	**May potentially occur.** • This portion of the study area lies within the geographic range of this species. • The redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests, as well as many other vegetation communities located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable nesting and foraging habitat. Buildings, bridges, and rock outcroppings adjacent to the Eel River and around the estuary provide suitable roosting habitat.	**May potentially occur.** • This portion of the study area supports appropriate habitat and lies within the geographic range of this species. • The chaparral, oak woodland, Douglas fir – ponderosa pine, gray pine, mixed hardwood, and Pacific Douglas fir forests along the East Branch Russian River provide suitable habitat. Buildings, bridges, and rock outcroppings along the East Branch Russian River provide suitable roosting habitat.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Lasiurus blossevillii	western red bat	—	—	SSC	Roosts in forests and woodlands from sea level up through mixed mesic conifer forests in coastal ranges and the Sierra Nevada. Forages in a variety of habitats including croplands, grasslands, shrublands, and open woodlands and forests. Prefers solitary roosts in trees and occasionally shrubs.	**Known to occur.** • Within geographic range of species. • Douglas fir – ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable foraging habitat. Additionally, the montane mixed conifer and hardwood forests and chapparal surrounding Lake Pillsbury provide suitable habitat. • Species may roost in large trees (particularly large black oaks). • This species was acoustically detected during surveys conducted in 2018 at the Fuller Grove, Navy Camp, Oak Flat, and Pillsbury Pines campgrounds (PG&E 2019a).	**Known to occur.** • Within geographic range of species. • Pacific Douglas fir, Douglas fir – ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. Additionally, the montane mixed chapparal to the southwest of Cape Horn Dam may provide suitable habitat. • The grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley Powerhouse area within and provide suitable foraging habitat. • Species may roost in large trees (particularly large black oaks). • This species was acoustically detected during surveys conducted in 2018 at Conduit No. 2 in the Potter Valley Powerhouse area, Van Arsdale Fish Screen Facility, and the Van Arsdale Tunnel No. 1 Gage Shaft (PG&E 2019a).	**May potentially occur.** • Within geographic range of species. • Redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable nesting habitat. The grasslands, prairies, and agricultural areas along both banks of the Eel River downstream of Arsdale Reservoir provide foraging habitat for this species. • Species may roost in large trees (particularly large black oaks).	**May potentially occur.** • Within geographic range of species. • Grassland, cropland, and agricultural land, and mixed hardwood stands along the East Branch Russian River provide suitable habitat for this species. • Species may roost in large trees (particularly large black oaks).

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Myotis thysanodes	fringed myotis	—	FSS	—	The fringed myotis is widespread in California, generally between 4,000–7,000 feet elevation. Optimal habitats are pinyon-juniper, valley foothill hardwood, and hardwood-conifer. It roosts in caves, mines, buildings, and crevices and uses open habitats, early successional stages, streams, lakes, and ponds as foraging areas.	**Known to occur.** • Within geographic range of species. • Douglas fir – Ponderosa pine and hardwood forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable terrestrial foraging habitat. The reservoir provides aquatic foraging habitat. • Large trees, rock outcrops, buildings, and bridges provide suitable roosting habitat. • This species was acoustically detected during surveys conducted in 2018 at the Fuller Grove campground (PG&E 2019a).	**May potentially occur.** • Within geographic range of species. • Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide terrestrial foraging habitat. The reservoir provides aquatic foraging habitat. • Large trees, rock outcrops, buildings, and bridges provide suitable roosting habitat.	**May potentially occur.** • Within geographic range of species. • Redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests, as well as many other vegetation communities located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable terrestrial foraging habitat. • The Eel River provides aquatic foraging habitat. • Buildings, bridges, and rock outcroppings adjacent to the Eel River and around the estuary provide suitable roosting habitat.	**May potentially occur.** • Within geographic range of species. • Douglas fir – ponderosa pine, gray pine, and Pacific Douglas fir forests along the East Branch Russian River provide suitable terrestrial habitat. Perennial lakes and ponds and the East Branch Russian River provide aquatic suitable foraging habitat. • Buildings, bridges, and rock outcroppings along the East Branch Russian River provide suitable roosting habitat.
Pekania pennanti	Fisher – West Coast DPS	—	FSS	SSC	Suitable habitat consists of large areas of mature, dense forest such as red fir, lodgepole pine, ponderosa pine, mixed conifer, and Jeffrey pine forests with snags and greater than 40 percent canopy closure.	**Known to occur.** • Within geographic range of species. • Douglas fir – ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable habitat. Additionally, the montane mixed conifer and hardwood forests surrounding Lake Pillsbury provide suitable habitat. • CNDDB records show one camera trap observation of fisher within a 1-mile buffer of this portion of the study area (CNDDB 2024).	**Known to occur.** • Within geographic range of species. • Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat where canopy cover is dense. • CNDDB records show one camera trap observation of fisher within a 1-mile buffer of this portion of the study area (CNDDB 2024).	**May potentially occur.** • Within geographic range of species. • Redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable nesting and foraging habitat where canopy cover is dense. • CNDDB records show two camera trap observations of fisher in this portion of the study area.	**May potentially occur.** • Within geographic range of species. • Douglas fir – ponderosa pine, gray pine, and Pacific Douglas fir forests along the East Branch Russian River provide suitable habitat where canopy cover is dense.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
MAY POTENTIALLY OCCUR IN THE STUDY AREA									
Insects									
Danaus plexippus	monarch butterfly	FC	—	—	A widespread species that can breed year-round in temperate climates. Monarchs lay their eggs on obligate milkweed host plants (*Asclepias* spp.). Adults can feed on many floral nectar sources. Multiple generations of monarchs are produced during the breeding season, with the last generation overwintering in established overwintering sites. California monarchs are known to overwinter at sites along the Pacific Coast from Sonoma to San Diego counties.	**May potentially occur.** • Within geographic range of species. • May forage wherever floral resources are present; species may also breed where milkweeds are present.	**May potentially occur.** • Within geographic range of species. • May forage wherever floral resources are present; species may also breed where milkweeds are present.	**May potentially occur.** • Within geographic range of species. • May forage wherever floral resources are present; species may also breed where milkweeds are present.	**May potentially occur.** • Within geographic range of species. • May forage wherever floral resources are present; species may also breed where milkweeds are present.
Birds									
Asio flammeus	short-eared owl	BCC	—	SSC	Short-eared owls live in large, open areas with low vegetation, including prairie and coastal grasslands, meadows, marshes, and agricultural areas.	**May potentially occur.** • Within geographic range of species. • The grassland and forbs area to the west of Scott Dam and on the north and east shores of Lake Pillsbury and the emergent wetlands on the north, east, and southeast shores of Lake Pillsbury provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The grasslands to the north of Cape Horn Dam and bordering the south shore of Van Arsdale Reservoir provide suitable foraging habitat. The grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley Powerhouse area within and provide suitable foraging habitat. The south side of Van Arsdale Reservoir supports two small emergent wetlands that provide suitable breeding habitat.	**May potentially occur.** • Within geographic range of species. • The grasslands, prairies, and agricultural areas along both banks of the Eel River downstream of Arsdale Reservoir provide foraging habitat for this species. Wet meadows and riparian areas along both banks of the Eel River downstream of Arsdale Reservoir provide suitable nesting and breeding habitat.	**May potentially occur.** • Within geographic range of species. • The grasslands, pastures, and agricultural areas located along East Branch Russian River provide suitable habitat.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Asio otus	long-eared owl	BCC	—	SSC	Uncommon resident throughout the state except for the Central Valley and Southern California deserts. Requires riparian habitat and uses oak thickets or other dense stands of trees. Forages in open areas in woodland and forested habitats.	**May potentially occur.** • Within geographic range of species. • The riparian mixed hardwood forests to the northwest of Scott Dam within and provides suitable nesting habitat. The Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable foraging habitat. Additionally, the montane mixed hardwood and conifer forests and chapparal surrounding Lake Pillsbury provide suitable foraging habitat.	**May potentially occur.** • Within geographic range of species. • The forested wetlands identified southeast of Cape Horn Dam along the shore of Van Arsdale Reservoir provide suitable breeding habitat. The Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat. Patches of open grasslands within these forests may provide suitable nesting habitat. Additionally, the montane mixed chapparal to the southwest of Cape Horn Dam may provide suitable nesting habitat.	**May potentially occur.** • Within geographic range of species. • The redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River downstream of Van Arsdale provide suitable nesting and foraging habitat.	**May potentially occur.** • Within geographic range of species. • The oak woodlands, Douglas fir – ponderosa pine, gray pine, mixed hardwood, black oak, blue oak, interior live oak, Oregon white oak, and Pacific Douglas fir forests along the East Branch Russian River provide suitable habitat.
Circus hudsonius	northern harrier	BCC	—	SSC	Occurs in a variety of habitats at elevations up to 10,000 feet. Forages in open areas such as meadows, wetlands, and grasslands. Breeding habitat is up to 5,700 feet in the Sierra Nevada in areas with shrubby vegetation near foraging habitat.	**May potentially occur.** • Within geographic range of species. • The grassland and forbs area to the west of Scott Dam and on the north and east shores of Lake Pillsbury and the emergent wetlands on the north, east, and southeast shores of Lake Pillsbury provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The grasslands to the north of Cape Horn Dam and bordering the south shore of Van Arsdale Reservoir provide suitable foraging habitat. The grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley Powerhouse area within and provide suitable foraging habitat. The south side of Van Arsdale Reservoir supports two small emergent wetlands that provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The grasslands, prairies, agricultural areas, wet meadows, and riparian areas along both banks of the Eel River from Arsdale Reservoir to the tributaries of the western most portion of the study area provide foraging habitat for this species. Montane mixed chapparal, chamise, scrub oak, manzanita chapparal, and other shrub vegetation communities along both banks of the Eel River downstream of Arsdale provide breeding and nesting habitat for this species.	**May potentially occur.** • Within geographic range of species. • The grasslands, croplands, and agricultural lands located along the Eastern Branch Russian River also provide suitable habitat for this species. Chamise, lower montane mixed chapparal, and scrub oak areas along the East Branch Russian River provide suitable breeding habitat.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Contopus cooperi	olive-sided flycatcher	BCC	—	SSC	Uncommon to common summer resident in a wide variety of forest and woodland habitats. Nesting habitats include mixed conifer, montane hardwood-conifer, Douglas-fir, redwood, red fir, and lodgepole pine forests from 3,000 to 7,000 feet in elevation.	**May potentially occur.** • Within geographic range of species. • The Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide foraging habitat. Additionally, the montane mixed hardwood and conifer forests surrounding Lake Pillsbury provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The Pacific Douglas fir, Douglas fir – Ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The redwood, Pacific Douglas fir, grand fir, Sitka spruce, redwood – Douglas fir, canyon live oak, gray pine, knobcone pine, blue oak, black oak, interior mixed hardwood, montane mixed hardwood, and riparian mixed hardwood forests located along both banks of the Eel River downstream of Van Arsdale provide suitable nesting and foraging habitat.	**May potentially occur.** • Within geographic range of species. • The oak woodlands, Douglas fir – ponderosa pine, gray pine, mixed hardwood, black oak, blue oak, interior live oak, Oregon white oak, and Pacific Douglas fir forests along the East Branch Russian River provide suitable habitat.
Ixobrychus exilis	least bittern	—	—	SSC	Habitat includes freshwater or brackish marshes with tall emergent vegetation.	**May potentially occur.** • Within geographic range of species. • The emergent wetlands on the north, east, and southeast shores of Lake Pillsbury provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The forested and emergent wetlands south of Cape Horn Dam on the shore of Van Arsdale reservoir provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The intermittent lakes and ponds, wet meadows located along the Eel River downstream of Van Arsdale Reservoir as well as the estuary provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • Emergent vegetation located along the Eastern Branch Russian River provides suitable habitat for this species.
Lanius ludovicianus	loggerhead shrike	—	—	SSC	Usually found in open areas with few trees, such as annual and perennial grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh emergent wetlands.	**May potentially occur.** • Within geographic range of species. • The grassland and forbs area to the west of Scott Dam and on the north and east shores of Lake Pillsbury and the emergent wetlands on the north, east, and southeast shores of Lake Pillsbury provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The study area lies within the geographic range of this species. • The grasslands to the north of Cape Horn Dam and bordering the south shore of Van Arsdale Reservoir provide suitable foraging habitat. The grasslands, agriculture, and pastures south of Cape Horn Dam and near the Potter Valley Powerhouse area within and provide suitable foraging habitat. The south side of Van Arsdale Reservoir supports two small emergent wetlands that provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • The study area lies within the geographic range of this species. • The grasslands, prairies, agricultural areas, wet meadows, and riparian areas along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable habitat for this species.	**May potentially occur.** • Within geographic range of species. • The study area lies within the geographic range of this species. • The grasslands, croplands, and agricultural lands located along the Eastern Branch Russian River also provide suitable habitat for this species.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Progne subis	purple martin	—	—	SSC	In the northwest of California, purple martins are concentrated in redwood forests near the coast but occupy many inland areas except at the highest elevations and the inner coast ranges.	**May potentially occur.** • Within geographic range of species. • Forested wetlands to the west and north of Scott Dam; Douglas fir – ponderosa pine forests southwest of Scott Dam; and riparian mixed hardwood area northwest of Scott Dam provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • This portion of the study area lies within the geographic range of this species. • Pacific Douglas fir, Douglas fir – ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • Redwood forests located along both banks of the Eel River downstream of Van Arsdale Reservoir provide suitable nesting and foraging habitat.	**May potentially occur.** • Within geographic range of species. • Snags within mixed hardwood and Pacific Douglas-fir habitat located along the East Branch Russian River provide suitable nesting habitat. • The East Branch Russian River provides suitable aquatic foraging habitat.
Mammals									
Martes caurina	Pacific marten or Humboldt marten (Note: This pertains to populations outside of the federally listed coastal marten DPS)	—	FSS	ST	Suitable marten habitat is strongly associated with mesic coniferous forests with relatively dense canopies that have a complex physical structure near the ground. Marten select stands with 40 percent canopy closure or greater for both resting and foraging. In California, the species' core elevation range is from 5,500 to 10,000 feet. On MNF, this translates into a patchy distribution of areas that might support a population or core areas within a metapopulation (Slauson et al. 2007).	**May potentially occur.** • Lies outside of the range for the federally listed coastal marten DPS; however, the study area supports appropriate habitat and lies within the geographic range of the Pacific marten. • The Douglas fir – Ponderosa pine forests on the east shore and northwest shore of Lake Pillsbury as well as southwest of Scott Dam provide suitable habitat where canopy cover is dense. Additionally, the montane mixed hardwood and conifer forests surrounding Lake Pillsbury provide suitable habitat where canopy cover is dense.	**May potentially occur.** • Lies outside of the range for the federally listed coastal marten DPS; however, the study area supports appropriate habitat and lies within the geographic range of the Pacific marten. • The Pacific Douglas fir, Douglas fir – ponderosa pine, and black oak forests to the east of Cape Horn Dam along Van Arsdale Reservoir provide suitable habitat in areas where canopy cover is dense.	**May potentially occur.** • Within geographic range of species. • This portion of the study area lies within the historical geographic range of this species. • The redwood, Pacific Douglas fir, grand fir, redwood – Douglas fir, gray pine, knobcone pine forests located along both banks of the Eel River downstream of Van Arsdale provide suitable habitat.	**May potentially occur.** • Within geographic range of species. • This portion of the study area lies within the historical geographic range of this species. • The oak woodlands, Douglas fir – ponderosa pine, gray pine, mixed hardwood, black oak, blue oak, interior live oak, Oregon white oak, and Pacific Douglas fir forests along the East Branch Russian River provide suitable habitat if the canopy density is suitable.
UNLIKELY TO OCCUR									
Birds									
Athene cunicularia	burrowing owl	BCC	—	SSC	Burrowing owl habitat consists of open areas with mammal burrows. They use a wide variety of arid and semi-arid environments, with well-drained level to gently sloping areas characterized by sparse vegetation and bare ground.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.

Scientific Name	Common Name	Federal Status	Forest Service Status	State Status	Habitat	Potential for Occurrence (Scott Dam Area)	Potential for Occurrence (Cape Horn Dam Area)	Potential for Occurrence (Eel River to Ocean)	Potential for Occurrence (East Branch Russian River to Lake Mendocino)
Empidonax traillii	willow flycatcher	—	FSS	SE	In California, wet meadow and montane riparian habitats in the Central Valley from 2,000 to 8,000 feet. Most often occurs in broad, open river valleys or large mountain meadows with lush growth of shrubby willows.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.
Mammals									
Gulo gulo	California wolverine	FT	FSS	ST, CFP	Mixed conifer, red fir, and lodgepole habitats and probably subalpine conifer, alpine dwarf shrub, wet meadow, and montane riparian habitats. Occurs in the Sierra Nevada from 4,300 to 10,800 feet. The majority of recorded sightings are found above 8,000 feet elevation. Denning habitat consists of caves, cliffs, hollow logs, and other cavities located in rocky areas free of human disturbance.	**Unlikely to occur.** • Study area is at the extreme known geographic extent for this species. Last sighting confirmed by MNF in 1978.	**Unlikely to occur.** • Study area is at the extreme known geographic extent for this species. Last sighting confirmed by MNF in 1978.	**Unlikely to occur.** • Outside the geographic range of the species.	**Unlikely to occur.** • Outside the geographic range of the species.
Martes caurina	Coastal DPS; also known as Humboldt marten	FT	—	ST	Optimal habitats are various mixed evergreen forests with more than 40 percent crown closure and large trees and snags for den sites. Most commonly found in red fir and lodgepole pine forests from 4,000 to 10,600 feet elevation.	**Unlikely to occur.** • The coastal marten DPS in California is restricted to Del Norte, Siskiyou, and Humboldt counties (USFWS 2018, 2020, USFWS 2021b, USFWS 2022). • USFWS has designated Critical Habitat for the coastal marten DPS; however, there is no Critical Habitat in the study area.	**Unlikely to occur.** • The coastal marten DPS in California is restricted to Del Norte, Siskiyou, and Humboldt counties (USFWS 2018, USFWS 2020, USFWS 2021b, USFWS 2022). • USFWS has designated Critical Habitat for the coastal marten DPS; however, there is no Critical Habitat in the study area.	**Unlikely to occur.** • The coastal marten DPS in California is restricted to Del Norte, Siskiyou, and Humboldt counties (USFWS 2018, 2020, USFWS 2021b, USFWS 2022). • USFWS has designated Critical Habitat for the coastal marten DPS; however, there is no Critical Habitat in the study area.	**Unlikely to occur.** • The coastal marten DPS in California is restricted to Del Norte, Siskiyou, and Humboldt counties (USFWS 2018, 2020, USFWS 2021b, USFWS 2022). • USFWS has designated Critical Habitat for the coastal marten DPS; however, there is no Critical Habitat in the study area.

Note: The study area for special-status terrestrial wildlife species includes (1) areas within 1 mile of the FERC Project boundary or river reaches historically affected by Project operations prior to decommissioning (the Eel River between Scott Dam and Van Arsdale Reservoir), (2) areas within a 0.5 mile buffer area from Cape Horn Dam downstream to the Middle Fork Eel River, as well as the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino, and (3) areas within 0.25 mile of the Eel River from its confluence with the Middle Fork Eel River downstream to the Eel River estuary outlet into the Pacific Ocean.

Federal Status

FT = Federally Threatened
FPT = Federal Proposed Threatened
FPE = Federally Proposed Endangered
FE = Federally Endangered
FC = Federal Candidate
FPD = Federal Proposed for Delisting
FD = Delisted Species
BCC = Birds of Conservation Concern

Forest Service Status

FSS = Forest Service Sensitive, Mendocino National Forest

State Status

ST = California Threatened
SE = California Endangered
SCT = Candidate for listing as California Threatened
SCE = Candidate for listing as California Endangered
CFP = California Fully Protected
SSC = California Species of Special Concern
WL = Watchlist

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of special-status biological resources and qualify as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.5-1a-i. CONFIDENTIAL special-status terrestrial wildlife occurrences documented in the study area.

The maps identified above are included in Volume III, Exhibit E Privileged Information—Biological Resources. Thess map will not be distributed to the general public but are being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Bald Eagle (FD, FSS, SE, CFP)

Bald eagles are known to occur on Lake Pillsbury and Van Arsdale Reservoir, and observations have been reported from multiple sources (CNDDB 2024; PG&E 2019b; USFS 2016). Confidential Map 3.3.5-2a shows bald eagle occurrences within 1 mile of the FERC Project boundary or river reaches historically affected by Project operations prior to decommissioning (the Eel River between Scott Dam and Van Arsdale Reservoir), and Map 3.3.5-2b shows the results of PG&E nest monitoring studies at Lake Pillsbury and Van Arsdale Reservoir.

Bald eagle monitoring has been conducted in the Project area since 2005. Per Article 54 of the current FERC license, bald eagle nesting surveys are conducted in the Project area annually, with reports published every 5 years (PG&E 2009, 2014, and 2019). Based on the most recent bald eagle monitoring report and bald eagle nesting territory forms (PG&E 2019b, 2021, 2022, 2023), there are seven active bald eagle territories in the Project area, with six concentrated around Lake Pillsbury and one additional territory at Van Arsdale Reservoir. Confidential Map 3.3.5-2b shows the location of bald eagle active and alternate nests recorded in the study area along with dates that nests were last active. Nest success at Lake Pillsbury has increased over the monitoring period, with 45 percent of nesting attempts being successful during the 2015–2019 monitoring period compared to 38 percent nesting success in the 2009–2014 monitoring period (PG&E 2019b). Nest success at Van Arsdale Reservoir was 60 percent. Over the 2015–2019 monitoring period, 19 young were produced across the territories. No nest survey data were collected in 2020 due to the COVID-19 pandemic. Since 2020, three of the seven territories successfully fledged a total of seven young (PG&E 2021, 2022). No young were successfully fledged in 2023 (PG&E 2023).

This Page Intentionally Left Blank

CONFIDENTIAL

The following map is being withheld from public disclosure in accordance with applicable regulations. This map contains details on the locations of special-status biological resources and qualifies as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following map is not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Map 3.3.5-2a. CONFIDENTIAL Bald eagle occurrences documented in the study area.

The map identified above is included in Volume III, Exhibit E Privileged Information—Biological Resources. This map will not be distributed to the general public but is being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

CONFIDENTIAL

The following map is being withheld from public disclosure in accordance with applicable regulations. This map contains details on the locations of special-status biological resources and qualifies as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following map is not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Map 3.3.5-2b. CONFIDENTIAL Bald eagle territories and nests on project reservoirs.

The map identified above is included in Volume III, Exhibit E Privileged Information—Biological Resources. This map will not be distributed to the general public but is being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Northern Spotted Owl (FT, FSS, ST, SSC)

The northern spotted owl is a federally threatened species with associated USFWS-designated critical habitat that occurs in the study area. The study area also lies within the California Coast physiographic province as defined in the Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011). Confidential Maps 3.3.5-3a through 3.3.5-3i show critical habitat for northern spotted owl within the study area. The maps also show potential nesting habitat and activity centers recorded by the MNF (USFS 2023), as well as northern spotted owl observations documented in the study area (CNDDB 2024; USFS 2024). There are multiple historical records of California spotted owl in this region (CNDDB 2024, USFS 2024), but only one nest in the study area since 2013 (CNDDB 2024; USFS 2024).

A study was conducted to evaluate and map potential nesting habitat for northern spotted owl within 0.5 mile of Project facilities in 2018 (PG&E 2019a). Based on the results of this study, there are approximately 2,071 acres of potential nesting habitat for northern spotted owl within 0.5 mile of Project facilities (refer to Table 3.3.5-4). Confidential Map 3.3.5-3a and Map 3.3.5-3b show the distribution of potential nesting habitat within 0.5 mile of Project facilities.

Wildfires (e.g., the 2017 Redwood Valley Fire, 2018 Ranch Fire, and 2020 August Complex Fire) have recently burned portions of the study area, including potential nesting habitat for northern spotted owl. Approximately 790 acres (38 percent) of the total potential nesting habitat was affected. Refer to Confidential Map 3.3.5-3a and Map 3.3.5-3b for the boundaries of these fires.

These fires may have affected the suitability of habitat for northern spotted owl, as some areas were extensively burned (i.e., stand-replacing wildfire). Because the northern spotted owl requires dense forest stands with large trees, loss of forest canopy and density in the fires may have reduced the habitat quality for this species. However, recent research suggests that northern spotted owls may be able to use intensively burned sites (Bond et al. 2022). Since the 2018 fires, no new nests have been recorded within the burn scar, but there have been two observations of northern spotted owl pairs within the Ranch Fire burn scar in the vicinity of Scott Dam (USFS 2024).

Northern (American) Goshawk (FSS, SSC)

The northern goshawk (*Accipiter gentilis*) recently underwent a taxonomic change to American goshawk (*Accipiter atricapillus*) in 2023 (Cornell Lab of Ornithology 2024). The MNF still lists this species as the northern goshawk; therefore, for the purposes of this document, northern goshawk is equivalent to American goshawk. Northern goshawks are associated with dense forests dominated by large trees and high canopy cover. There are three northern goshawk historical nests recorded within the study area (CNDDB 2024).

A study was conducted to evaluate and map potential nesting habitat for northern goshawk within 0.5 mile of Project facilities in 2018 (PG&E 2019a). Based on the results of this study, there are approximately 2,397 acres of potential nesting habitat for northern goshawk within 0.5 mile of Project facilities (refer to Table 3.3.5-4). Refer to Map 3.3.5-4 for the distribution of potential northern goshawk nesting habitat within 0.5 mile of Project facilities.

Wildfires (e.g., the 2017 Redwood Valley Fire, 2018 Ranch Fire, and 2020 August Complex Fire) have recently burned portions of the study area. Approximately 903 acres (38 percent) of the total potential nesting habitat was affected. Refer to Map 3.3.5-4 for the boundaries of these fires. These fires may have affected the suitability of habitat for northern goshawk, as some areas were extensively burned (i.e., stand-replacing wildfire). Because the northern goshawk requires dense forest stands with large trees, loss of forest canopy and density in the fires may have reduced the habitat quality for this species. There are currently no data available on nest records or nest success post-fire specifically in this region.

Fisher – West Coast DPS (FSS, SSC)

Fisher are associated with dense forests dominated by large trees and high canopy cover. There are four records of fisher in the study area (CNDDB 2024).

A study was conducted to evaluate and map potential denning habitat for fisher within 0.5 mile of Project facilities in 2018 (PG&E 2019a). Based on the results of this study, there are approximately 1,430 acres of potential denning habitat for fisher within 0.5 mile of Project facilities (refer to Table 3.3.5-4). Refer to Map 3.3.5-5 for the distribution of potential fisher denning habitat within 0.5 mile of Project facilities.

Wildfires (e.g., the 2017 Redwood Valley Fire, 2018 Ranch Fire, and 2020 August Complex Fire) have recently burned portions of the study area. Approximately 544 acres (38 percent) of the total potential denning habitat was affected. Refer to Map 3.3.5-5 for the boundaries of these fires. These fires may have affected the suitability of habitat for fisher, as some areas were extensively burned (i.e., stand-replacing wildfire). Because the fisher requires dense forest stands with large trees, loss of forest canopy and density in the fires may have reduced the habitat quality for this species. There are currently no data available on denning records or den success post-fire specifically in this region.

Pacific Marten (FSS, ST)

The Pacific marten is associated with mesic coniferous forests with relatively dense canopies that have a complex physical structure near the ground. Marten select stands with 40 percent canopy closure or greater for both resting and foraging. In California, the species' core elevation range is from 5,500 to 10,000 feet (ft.). On the MNF, this translates into a patchy distribution of areas that might support a population or core areas within a metapopulation (Slauson et al. 2007). There is now historical record for Pacific marten in the study area (CNDDB 2024).

In 2020, USFWS listed a subspecies of marten, the coastal marten DPS, as a threatened species (USFWS 2020). The range of the coastal marten DPS in California is limited to Humboldt, Del Norte, and Siskiyou counties and does not overlap with the study area. In addition, USFWS-designated critical habitat for the coastal marten DPS does not overlap with the study area.

In 2018, PG&E evaluated and mapped potential denning habitat for Pacific marten within 0.5 mile of Project facilities (PG&E 2019). Based on the results of this study, there are approximately 1,502 acres of potential denning habitat for Pacific marten within 0.5 mile of Project facilities (refer to Table 3.3.5-4). Refer to Map 3.3.5-6 for the distribution of potential Pacific marten denning habitat within 0.5 mile of Project facilities.

Wildfires (e.g., the 2017 Redwood Valley Fire, 2018 Ranch Fire, and 2020 August Complex Fire) have recently burned portions of the study area. Approximately 588 acres (39 percent) of the total potential denning habitat was affected. Refer to Map 3.3.5-6 for the boundaries of these fires. These fires may have affected the suitability of habitat for Pacific marten, as some areas were extensively burned (i.e., stand-replacing wildfire). Because the Pacific marten requires dense forest stands with large trees, loss of forest canopy and density in the fires may have reduced the habitat quality for this species. There are currently no data available on denning records or den success post-fire specifically in this region.

This Page Intentionally Left Blank

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of special-status biological resources and qualify as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.5-3a-i CONFIDENTIAL northern spotted owl critical habitat, suitable nesting/roosting habitat, and known occurrences in the study area.

The maps identified above are included in Volume III, Exhibit E Privileged Information—Biological Resources. These maps will not be distributed to the general public but are being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Table 3.3.5-4. Existing acreages of habitat for special-status birds and special-status furbearers within 0.5 mile of Project facilities.

CWHR Tree Size/Density Classes	Acres within CWHR Habitat Types[1]						
	Douglas-Fir	Montane Hardwood	Montane Hardwood Conifer	Montane Riparian	Ponderosa Pine	Sierran Mixed Conifer	Total
Northern Spotted Owl							
6	0	0	0		0	0	**0**
5D	331	318	0		188	0	**836**
4D	562	379	0		294	0	**1,235**
Total	**893**	**696**	**0**		**482**	**0**	**2,071**
Northern Goshawk							
6	0	0	0	0	0	0	**0**
5D	331	318	0	21	188	0	**857**
5M	3	68	0	0	56	0	**129**
4D	562	379	0	34	294	0	**1,269**
4M	0	130	0	12	0	0	**142**
Total	**896**	**895**	**0**	**68**	**538**	**0**	**2,397**
Fisher							
6	0		0	0	0	0	**0**
5D	331		0	32	188	0	**539**
4D	562		0	34	294	0	**890**
Total	**893**		**0**	**55**	**482**	**0**	**1,430**
Pacific Marten							
6	0		0	0	0	0	**0**
5D	331		0	21	188	0	**539**
5M	3		0	0	56	0	**60**
4D	562		0	34	294	0	**890**
4M	0		0	12	0	0	**12**
Total	**896**		**0**	**68**	**538**	**0**	**1,502**

1. A dark gray shaded cell indicates that the habitat type is not used by the species. Note that new information on any changes in CWHR habitats since the recent Redwood Valley (2017), Ranch (2018), and August Complex (2020) fires is not available at this time.

This Page Intentionally Left Blank

CONFIDENTIAL

The following map is being withheld from public disclosure in accordance with applicable regulations. This map contains details on the locations of special-status biological resources and qualifies as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following map is not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Map 3.3.5-4 CONFIDENTIAL northern goshawk potential nesting habitat within 0.5-mile buffer of Project facilities.

The map identified above is included in Volume III, Exhibit E Privileged Information—Biological Resources. This map will not be distributed to the general public but is being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

CONFIDENTIAL

The following map is being withheld from public disclosure in accordance with applicable regulations. This map contains details on the locations of special-status biological resources and qualifies as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following map is not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Map 3.3.5-5 CONFIDENTIAL fisher – West Coast DPS potential denning habitat within 0.5-mile buffer of Project facilities.

The map identified above is included in Volume III, Exhibit E Privileged Information—Biological Resources. This map will not be distributed to the general public but is being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

CONFIDENTIAL

The following map is being withheld from public disclosure in accordance with applicable regulations. This map contains details on the locations of special-status biological resources and qualifies as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following map is not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Map 3.3.5-6 CONFIDENTIAL Pacific marten potential denning habitat within 0.5-mile buffer of Project facilities.

The map identified above is included in Volume III, Exhibit E Privileged Information—Biological Resources. This map will not be distributed to the general public but is being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Special-Status and Other Bats

In 2018, a study was conducted to evaluate Project facilities for the potential to contain bat roosts (PG&E 2019a). A roost survey was conducted at all Project facilities determined to have suitability for roosting bats. The species of bats using the roost was determined using visual capture and/or guano DNA sampling methods following the methods described by Walker et al. (2016). Refer to Table 3.3.5-5 for a list of Project facilities with the potential to support bat roosts, as well as the results of the roost surveys. Two common bat species, including the little brown bat (*Myotis lucifugus*) and Yuma myotis (*Myotis yumanensis*), were confirmed roosting in Project facilities. No special-status bat roosts were identified.

Special-status bats—including pallid bats (FSS, SSC), Townsend's big-eared bats (FSS, SSC), western mastiff bats (SSC), western red bats (SSC), and fringed myotis (FSS)—were detected on acoustic detectors deployed in the Project area and may use habitats in the surrounding Project area for roosting and foraging. Seven common bat species were also detected during acoustic studies. Refer to Map 3.3.5-7a and Map 3.3.5-7b for the locations where special-status bat species were detected on acoustic sampling equipment.

This Page Intentionally Left Blank

Table 3.3.5-5. Results of visual assessment, roost survey, and guano DNA analysis at suitable Project facilities.

Facility	Visual Assessment[1]	Roost Type (Day/Night/Maternity)	Guano Sampling[1]		Species Identification	
			Guano Present? (Yes/No)	Guano Sample Collected?[2] (Yes/No)	Species Identified[3]	Species Identification Method (Visual/Guano DNA Analysis)
POTTER VALLEY POWERHOUSE AREA						
Conduits, Penstocks, and Control and Valve Houses						
Conduit No. 1: Upper Wood Stave, Steel Pipe, and Components	Potential night-roosting structure; however, no roost was identified during survey	No Roost Present	No	No	None	—
Conduit No. 2: Lower Wood Stave, Steel Pipe, and Components	Potential low-quality night-roosting structure	Night	Yes	No	Unknown	—
Conduit No. 1: 72-inch Butterfly Valve House, Standpipe, and Surge Chamber Vent	Guano present on exterior indicating potential night roost	Night	Yes	Yes	Unknown	Guano DNA Analysis: Sample was too degraded to positively identify species.
Powerhouse, Switchyard, and Tailrace						
Potter Valley Powerhouse: Potter Valley Powerhouse Building	Guano observed in small amounts around full perimeter; small amounts of guano present in "Rattlesnake Room"	Night	Yes	Yes	*Myotis yumanensis*	Guano DNA Analysis
Potter Valley Powerhouse: Potter Valley Powerhouse Cabana Outbuilding	Guano and *Myotis* sp. bats observed in meeting cabana west of the office building	Day	Yes	Yes	*Myotis yumanensis*	Guano DNA Analysis
VAN ARSDALE RESERVOIR AREA (CAPE HORN DAM)						
Tunnels and Adits						
Tunnel No. 1 Gage Shaft (Control Building)	Extensive bat guano deposits within the structure and a small amount along exterior of building	Day	Yes	Yes	*Myotis yumanensis*	Guano DNA Analysis
Fish Screen, Fish Ladder, and Associated Facilities						
Van Arsdale Fish Screen Facility Storage	Small amount of guano in fish screen storage building	Night	Yes	No	Unknown	—
Van Arsdale Fish Screen Facility Motor Control Building	Night-roosting activity under eves; mixed guano indicates multiple species roost. A live bat was captured at this located and visually identified. In addition, a female bat with juvenile was observed in July 2018.	Maternity/Day/Night	Yes	Yes	*Myotis yumanensis*	Visual and Guano DNA Analysis
Fish Attraction Facility (Fish Hotel)	Bat roosting has been previously observed in this structure (Anderson, pers. comm. 2024)	Unknown	No	No	Unknown	—

Facility		Visual Assessment[1]	Roost Type (Day/Night/Maternity)	Guano Sampling[1]		Species Identification	
				Guano Present? (Yes/No)	Guano Sample Collected?[2] (Yes/No)	Species Identified[3]	Species Identification Method (Visual/Guano DNA Analysis)
SCOTT DAM AREA							
Dams							
Scott Dam		Night roost on exterior only	Night	Yes	No	Unknown	—
CAMPGROUND AND DAY USE FACILITIES BY GEOGRAPHIC AREA							
Fuller Grove	Fuller Grove Campground	Moderate amounts of bat guano on exterior restrooms	Night	Yes	Yes	*Myotis yumanensis*	Guano DNA Analysis
Fuller Grove	Fuller Grove Group Campground	Live bats observed and captured in group campground restroom	Day	Yes	Yes	*Myotis yumanensis*	Visual and Guano DNA Analysis
Fuller Grove	Fuller Grove Day Use Area and Boat Launch	Small amount of guano on exterior walls and one live bat observed and captured	Day	Yes	No	*Myotis yumanensis*	Visual
Navy Campground		Night roosts on campground bathrooms	Day/Night	Yes	Yes	*Myotis lucifugus*	Guano DNA Analysis
Oak Flat Campground		Light night roosting	Night	Yes	No	Unknown	—
Pillsbury Pines Day Use Area and Boat Launch		Day roosting observed. Live bat observed during surveys.	Day	Yes	No	Small *Myotis* spp.	Visual
Pogie Point	Pogie Point Campground	All bathrooms have guano deposits; one has extensive guano deposits	Day/Night	Yes	Yes	*Myotis yumanensis*	Guano DNA Analysis
Pogie Point	Pogie Point Day Use Area	The bathroom had two different sizes of bat guano on exterior	Night	Yes	Yes	Unknown	Guano DNA Analysis: Sample was too degraded to identify species.
Sunset Point Campground		Moderate to large guano deposits on the exterior of the bathrooms	Night	Yes	Yes	*Myotis yumanensis*	Guano DNA Analysis
Trout Creek Campground		Bathrooms showed limited guano; potential night roosting	Night	Yes	No	Unknown	—

1. Visual assessment was completed on July 23, 2018. The roost survey and guano sampling were conducted on September 13 and 20, 2018.
2. Guano samples were collected when deposits were significant enough to indicate regular use and when the sample was fresh enough to enable identification of species during DNA analysis (Walker et al. 2016).
3. None = No bats identified through visual observation or guano samples; Unknown = Bat was observed or guano was present, but species was not identifiable.

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of special-status biological resources and qualify as Confidential Information (18 CFR §385.1112). Disclosure of such information could be harmful to these resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.5-7a-b CONFIDENTIAL special-status bat species identified on acoustic detectors during 2018 relicensing studies in the Project area.

The maps identified above are included in Volume III, Exhibit E Privileged Information—Biological Resources. These maps will not be distributed to the general public but is being e-filed with FERC under the "Privileged" tab and is labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

This Page Intentionally Left Blank

Game Species

A game species is an animal that is hunted by people for sport or food. Information on game species potentially present in the Project vicinity is provided in this section because of their commercial and recreational value. Game species are regulated by CDFW and are defined under the California Fish and Game Code as follows:

- Game birds are defined in California Fish and Game Code §3500. Examples of game birds include American coot, mallard, wild turkey, mountain quail, California quail, and mourning dove.
- Game mammals are defined in California Fish and Game Code §3950(a) to include (but are not limited to) deer, tule elk, wild pig, black bear, rabbits and hares, and tree squirrels. Note that mountain lions are included in §3950 but are explicitly excluded as a game mammal in §3950.1.

This section describes special-status terrestrial wildlife that occur or may potentially occur in the vicinity of the Project. The study area for special-status terrestrial wildlife species includes (1) areas within 1 mile of the FERC Project boundary or river reaches historically affected by Project operations prior to decommissioning (the Eel River between Scott Dam and Van Arsdale Reservoir), (2) areas within a 0.5 mile buffer area from Cape Horn Dam downstream to the Middle Fork Eel River, as well as the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino, and (3) areas within 0.25 mile of the Eel River from its confluence with the Middle Fork Eel River downstream to the Eel River estuary outlet into the Pacific Ocean. Game species described in the California Fish and Game Code were evaluated for their likelihood to occur based on the geographic and elevation range of the Project and wildlife habitats present. A table was then developed listing each species and its status, followed by a generalized habitat description and a summary of applicable CDFW hunting regulations.

Table 3.3.5-6 lists the resident and migratory game birds and game mammals that have the potential to occur in the study area, their habitat requirements, and a summary of state hunting regulations for each species. Hunting of game species is permitted during seasons regulated by CDFW.

A brief summary of common game species in the Project vicinity, including resident game birds, migratory game birds, and game mammals, is provided below.

Resident and Migratory Game Birds

Upland birds occurring in the Project vicinity that meet the definition of resident game birds (California Fish and Game Code §3500) include (but are not limited to) wild turkey, mountain quail, and California quail. Birds that meet the definition of migratory game birds include band-tailed pigeon and mourning dove.

Game Mammals

Mammals occurring in the Project vicinity that meet the definition of game mammals (California Fish and Game Code §3950) include rabbits, squirrels, deer, elk, and bear. Additional information on two important game mammals in the Project vicinity, black-tailed deer and tule elk, is provided below.

Black-tailed Deer

Black-tailed deer are one of nine subspecies of the widely distributed mule deer. Black-tailed deer live in the temperate coniferous forests along the Pacific Coast. These forests are characterized by cool temperatures and high annual rain amounts but an overall mild climate (Natural History Museum 2016). They prefer a mosaic of various-aged vegetation that provides woody cover, meadow and shrubby openings, and free water. Black-tailed deer do not, therefore, migrate in response to seasonal changes, unlike some other mule deer subspecies. Instead, black-tailed deer often spend their entire lives in the same general area (Natural History Museum 2016). The black-tailed deer population in the Lake Pillsbury area has a range that extends from the San Francisco Bay in the South, the Oregon state border in the north, the Sierra mountain range in the east, and the Pacific Ocean in the west (Pease et al. 2009). They feed on different types of grasses, lichens, plants, and sometimes berries.

The Project area and vicinity span two hunt zones, including Zone A (North Unit 160) and Zone B1 (CDFW 2024e). Zone A is found in all areas south of the Eel River in the Project vicinity, while Zone B1 is found north of the Eel River and includes Lake Pillsbury (CDFW 2024e).

Black-tailed deer are managed by CDFW. Black-tailed deer were observed in the Project area during studies conducted in 2018.

Tule Elk

Tule elk are endemic to California, and it is estimated that early population levels in the mid-1800s were near 500,000 (CDFW 1982). Due to loss of habitat and human–wildlife conflicts, tule elk populations were on the decline, and by the late 1860s, they were exterminated from all but one small locale in the southern San Joaquin Valley (CDFW 1982). The U.S. Congress passed a law in 1976 requiring suitable federal lands be made available for tule elk, and they became managed by CDFW. In the late 1970s and early 1980s, tule elk were introduced to the Lake Pillsbury Basin (Lake Pillsbury Tule Elk Herd) (CDFW 1982). In 1978, CDFW relocated 38 tule elk to the Lake Pillsbury area (CDFW 1982). Twenty-two more were introduced in 1990 (CDFW 1982). Today, they are often seen on the north side of Lake Pillsbury on the MNF Upper Lake Ranger District and also in Potter Valley and the surrounding foothills near the East Branch Russian River. Tule elk are protected by the Public Trust Doctrine on both public and private lands for present and future generations as an integral component of the native landscape (California Nature Center 2013). Hunting is regulated by CDFW.

Tule elk were observed along the northern shore of Lake Pillsbury in the Project vicinity during a tule elk forage study conducted in 2018 (PG&E 2019a). The elk were observed primarily in small herds, but occasionally large groups were observed (see Figure 3.3.5-1 below). The most common forage species observed during the study were Parish's spike rush (*Eleocharis parishii*), bulrushes (*Isolepis* spp.), Mediterranean beard grass (*Polypogon maritimus*), and floating pondweed (*Potamogeton natans*).

Figure 3.3.5-1. A herd of tule elk foraging in the exposed inundation zone at the north end of Lake Pillsbury. The photograph was taken in July 2018.

This Page Intentionally Left Blank

Table 3.3.5-6. Game species potentially occurring in the study area.

Scientific Name	Common Name	Status	Habitat	General Hunting Season	Bag Limit	Possession Limit	Hunting Restrictions[1]
Migratory and Resident Game Birds							
Branta canadensis	Canada goose	—	Common resident and migrant found throughout the state in fresh emergent wetlands; estuarine, lacustrine, and riverine habitats; ponds; pastures; croplands; and urban parks.	Early Season (large only): September 30–October 2 Regular Season: October 21–January 28	30 per day	Triple the daily bag limit	Hunting license and state duck tag are required. Must use 10-gauge shotgun or smaller, and shot must be non-lead and non-toxic. Electronically operated calling or sound-reproducing devices are prohibited. No use of practice dogs on birds outside of season. No take of nests or eggs.
Callipepla californica	California quail	—	Common, permanent resident of low and middle elevations. Found in shrub, scrub, and brush; open stages of conifer and deciduous habitats; and margins of grasslands and croplands.	Zone Q1: October 21–January 28	10 per day	Triple the daily bag limit	Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than ball bearing. May also use falconry, bow, or crossbow.
Columba fasciata	band-tailed pigeon	—	Common resident in hardwood and hardwood-conifer habitats. Inhabits lower slopes of major mountain ranges of the state.	Northern Zone: The third Saturday in September extending for nine consecutive days Southern Zone: The third Saturday in December extending for nine consecutive days	2 per day	Triple the daily bag limit	Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than ball bearing. May also use falconry, bow, or crossbow.
Dendragapus fuliginosus	sooty grouse	—	Uncommon to common permanent resident at middle to high elevations. Occurs in open, medium to mature aged stands of fir, Douglas-fir, and other conifer habitats, interspersed with medium to large openings and available water.	General: September 9–October 9 Archery Only: August 19–September 8 Falconry: August 19–February 29	2 sooty grouse per day	Triple the daily bag limit	Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than ball bearing. May also use falconry, bow, or crossbow.
Fulica americana	American coot	—	Common resident and migrant found throughout the state in a wide variety of freshwater wetlands where there are heavy stands of emergent aquatic vegetation along the shore and some depth of water where the emergent vegetation is present.	October 21–January 31	25 per day	Triple the daily bag limit.	Hunting license and state duck tag are required. Must use 10-gauge shotgun or smaller, and shot must be non-lead and non-toxic. Electronically operated calling or sound-reproducing devices are prohibited. No use of practice dogs on birds outside of season. No take of nests or eggs. May also use falconry, bow, or crossbow.
Gallinago gallinago	Wilson's snipe	—	Fairly common winter visitor from October to April on wet meadow and short, emergent wetland habitats throughout much of California.	October 21–February 4	8 per day	Triple the daily bag limit	Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than ball bearing. May also use falconry, bow, or crossbow.

Scientific Name	Common Name	Status	Habitat	General Hunting Season	Bag Limit	Possession Limit	Hunting Restrictions[1]
Meleagris gallopavo	wild turkey	—	Found mostly in deciduous riparian, oak, and conifer-oak woodlands. Prefers rugged, hilly terrain with low to intermediate canopy, interspersed with numerous grass/forb openings near water.	Fall Season: November 11–December 10 Spring Season: General: March 30–May 5 Archery Only: May 6–May 19 Additional Junior: March 23–24 & May 6–19	Fall Season: 1 per day of either sex Spring Season: 1 bearded turkey per day	Fall Season: 2 per season Spring Season: 3 per season combined	Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than No. 2. May also use falconry, bow, or crossbow.
Oreortyx pictus	mountain quail	—	Common to uncommon resident found typically in most major montane habitats of the state. Found seasonally in open, brushy stands of conifer and deciduous forest, woodland, and chaparral.	Zone Q1: September 9–October 20	10 per day	Triple the daily bag limit	Hunting license is required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than ball bearing. May also use falconry, bow, or crossbow.
Zenaida macroura	mourning dove	—	Open woodlands, grasslands, croplands, open hardwood, hardwood-conifer, riparian, low-elevation conifer, and deserts all provide adequate habitat. Requires a nearby water source.	September 1–15 and November 11–December 25	15 doves	Triple the daily bag limit	Hunting license and state duck tag are required. No use of motor vehicles to drive birds toward target. No use of mammal (or imitation) as blind. No take of nests or eggs. No use of practice dogs on birds outside of season. Must use 10-gauge shotgun or smaller, and no shot size larger than BB. May also use falconry, bow, or crossbow.

Scientific Name	Common Name	Status	Habitat	General Hunting Season	Bag Limit	Possession Limit	Hunting Restrictions[1]
Ducks and Dabblers							
Aix sponsa	wood duck	—	Common resident and migrant found throughout the state in wetlands, swamps, freshwater marshes, beaver ponds, and streams of all sizes.	October 5–January 15	7 per day	Triple the daily bag limit.	Hunting license and state duck tag are required. Must use 10-gauge shotgun or smaller, and shot must be non-lead and non-toxic. Electronically operated calling or sound-reproducing devices are prohibited. No use of practice dogs on birds outside of season. No take of nests or eggs. May also use falconry, bow, or crossbow.
Anas acuta	northern pintail	—	Nests in open country with shallow, seasonal wetlands and low vegetation. Winters in wide variety of shallow inland freshwater and intertidal habitats.		1 per day		
Anas crecca	green-winged teal	—	Common resident and migrant found throughout the state in river deltas, forest wetlands, grassland and sedge meadows, beaver ponds, streams, potholes, lakes, and humanmade wetlands. Winter in shallow wetlands, riparian sloughs, and rice fields.		7 per day		
Anas platyrhynchos	mallard	—	Common resident and migrant found throughout the state in fresh emergent wetlands; estuarine, lacustrine, and riverine habitats; ponds; pastures; croplands; and urban parks.		7 per day (no more than 2 females)		
Aythya affinis	lesser scaup	—	Found on lakes and ponds. Winters in fresh or brackish water.	October 5–December 1 December 19–January 15	2 per day		
Aythya americana	redhead	SSC (nesting)	Prefer non-forested environments with water areas sufficiently deep to provide permanent and fairly dense emergent vegetation for nesting.	October 5–January 15	2 per day		
Aythya collaris	Ring-necked duck	—	Ring-necked ducks are frequently seen in quite shallow waters (4 ft. deep or less) where patches of open water are fringed with aquatic or emergent vegetation such as sedges, lilies, and shrubs.		7 per day		
Bucephala albeola	bufflehead	—	Uncommon to locally common east of the Sierra Nevada crest. Breeds in tree cavities near lakes and ponds bordered by open forest.		7 per day		
Gallinula galeata	common gallinule	—	Freshwater or brackish marshes with tall emergent vegetation, ponds, canals, and rice fields.	October 21–January 31	25 per day		
Lophodytes cucullatus	hooded merganser	—	Freshwater or brackish wetlands, lakes, and ponds. During migration, they stop in a wider range of habitats, including open rivers and lakes, brackish coastal bays, tidal creeks, and seasonally flooded forest.	October 5–January 15	7 per day		
Mergus merganser	common merganser	—	Uncommon to locally common resident and migrant on lakes, ponds, and large streams of the Coast, Klamath, Cascade, and Sierra Nevada ranges.				
Oxyura jamaicensis	ruddy duck	—	Inhabit permanent freshwater marshes, lakes, and ponds during their breeding season. These pools contain a considerable amount of vegetation in which these ducks hide their nests. During the winter, ruddy ducks prefer shallow marshes and coastal bays.				

Scientific Name	Common Name	Status	Habitat	General Hunting Season	Bag Limit	Possession Limit	Hunting Restrictions[1]
Game Mammals							
Cervus elaphus nannodes	tule elk	—	Tule elk breed in open, brushy stands of many deciduous and conifer habitats with abundant water. They feed in riparian areas, meadows, and herbaceous and brush stages of forest habitats.	Zone 5: Mendocino Mendocino Bull: September 25–October 6 Zone 6: Lake Pillsbury Period 1 Antlerless: September 11–20 Period 2 Bull: September 30–October 9	Zone 5: Mendocino Mendocino Bull: 2 tags are issued Zone 6: Lake Pillsbury Period 1 Antlerless: 4 tags are issued Period 2 Bull: 2 tags are issued	1 elk per season	Hunting license is required. May use firearms or archery equipment in accordance with Sections 353 and 354 in Title 14 California Code of Regulations (California Fish and Game Code 2024).
Lepus californicus	black-tailed jackrabbit	—	Found in a variety of habitats throughout the state, particularly in grasslands and desert-shrub areas on open, early stages of forests and chaparral.	Open all year	No limit	No limit	This species is considered resident small game under the California Fish and Wildlife Code. Hunting license is required. May use shotguns, bow and arrow, air rifles, or pistols. Must use 10-gauge shotgun or smaller, and no shot size larger than BB. Coursing dogs may be used to take rabbits.
Mustela vison	American mink	—	Uncommon permanent resident, generally occurring in the northern half of the state. Semiaquatic, inhabiting most aquatic habitats, including some coastal areas. Occurs at elevation up to about 9,000 ft.	November 16–March 31	No limit	No limit	This species is considered a furbearing mammal under the California Fish and Wildlife Code. Hunting license is required. May use firearms, bow and arrow, and approved traps with trapping permit.
Odocoileus hemionus columbianus	black-tailed deer	—	This species is restricted to the northwest corner of the state between San Francisco Bay in the south, the Oregon state border in the north, the Sierra Nevada range in the east, and the Pacific Ocean in the west. It prefers a mosaic of various-aged vegetation that provides woody cover, meadow and shrubby openings, and free water.	The season in Zone X-9a shall open on the third Saturday in September and extend for 24 consecutive days	1 buck (forked horn or better)/tag	1 buck (forked horn or better)/tag	This species is considered a big game mammal under the California Fish and Wildlife Code. Requires hunting license and hunting tags. May use approved rifles, bow and arrow, approved shotguns, and crossbows. Only bucks with antlers with demonstrable forks (or greater) may be taken.
Procyon lotor	raccoon	—	Widespread, common to uncommon permanent resident throughout most of the state. Occurs in all habitats except alpine and desert types without water; marginal in Great Basin shrub types. Most abundant in riparian and wetland areas at low to middle elevations.	November 16–March 31	No limit	No limit	This species is considered a furbearing mammal under the California Fish and Wildlife Code. Hunting license is required. May use firearm, bow and arrow, or with the use of dogs or traps in accordance with trapping regulations. When taking raccoons after dark, pistols and rifles not larger than 22-caliber rimfire and shotguns using shot no larger than No. BB are the only firearms that may be used during this night period. Dogs may be permitted to pursue raccoons in the course of breaking, training, or practicing dogs.
Sciurus griseus	western gray squirrel	—	Fairly common locally in mature stands of most conifer, hardwood, and mixed hardwood-conifer habitats in the Klamath, Cascade, Transverse, Peninsular, and Sierra Nevada ranges. Dependent upon mature stands of mixed conifer and oak habitats. Closely associated with oaks. Require large trees, mast, and snags.	General: September 9–January 28 Archery/Falconry Only: August 5–September 8	4 per day	4 in possession	This species is considered resident small game under the California Fish and Wildlife Code. Hunting license is required. Must use 10-gauge shotgun or smaller, no shot size larger than BB, and bow and arrow.

Scientific Name	Common Name	Status	Habitat	General Hunting Season	Bag Limit	Possession Limit	Hunting Restrictions[1]
Sus scrofa	wild pig	—	Wild pigs currently exist in 56 of the state's 58 counties and can be found in a variety of habitats ranging from woodland, chaparral, meadow, and grasslands. Wild pigs are omnivorous, consuming both plant and animal matter. In general, wild pigs feed on grasses and forbs in the spring; mast and fruits in the summer and fall; and roots, tubers, and invertebrates throughout the year.	All year	No limit	No limit	This species is considered a big game mammal under the California Fish and Wildlife Code. Tag required.
Sylvilagus bachmani	brush rabbit	—	The brush rabbit inhabits dense, brushy cover most commonly in chaparral vegetation. It also occurs in oak and conifer habitats, and it will live in brush or grassland and form networks of runways through the vegetation.	General: July 1–January 28 Falconry Only: August 5–September 8	5 per day	10 in possession	This species is considered resident small game under the California Fish and Wildlife Code. Hunting license is required. Must use 10-gauge shotgun or smaller, no shot size larger than BB, and bow and arrow.
Tamiasciurus douglasii	Douglas' squirrel	—	Fairly common yearlong resident of conifer, hardwood-conifer, and riparian habitats in the Sierra Nevada, Cascade, Klamath, North Coast, and Warner ranges from sea level to 11,000 ft. Prefers mature trees with substantial crown closures; breeds in cavities in trees and snags.	General: September 9–January 28 Archery/Falconry Only: August 5–September 8	4 per day	4 in possession	This species is considered resident small game under the California Fish and Wildlife Code. Hunting license is required. Must use 10-gauge shotgun or smaller, no shot size larger than BB, and bow and arrow.
Urocyon cinereoargenteus	gray fox	—	Uncommon to common permanent resident of low to middle elevations throughout most of the state. Frequents most shrublands, valley foothill riparian, montane riparian, and brush stages of many deciduous and conifer forest and woodland habitats. Also found in meadows and cropland areas. Suitable habitat consists of shrublands and brushy and open-canopied forests, interspersed with riparian areas providing water.	November 24 through last day of February	No limit	No limit	This species is considered a furbearing mammal under the California Fish and Wildlife code. Hunting license is required. May use firearms, bow and arrow, and approved traps with trapping permit. Dogs permitted.
Ursus americanus	black bear	—	This species is considered a big game mammal under the California Fish and Wildlife Code. Widespread, common to uncommon resident occurring from sea level to high mountain regions. Occurs in fairly dense, mature stands of many forest habitats and feeds in a variety of habitats including brushy stands of forest, valley foothill riparian stands, and wet meadow.	Opens with deer season through December 7 or 31 or until 1,700 bears are harvested	1 adult/season/tag	1 adult/season/tag	This species is considered a big game mammal under the California Fish and Wildlife Code. Requires hunting license and hunting tags. May use approved rifles, bow and arrow, and approved shotguns. Cubs and females accompanied by cubs may not be taken.

Source: CDFW 2024a

Note: The study area for game species includes areas within 5 miles of the FERC Project boundary or river reaches historically affected by Project operations (the Eel River between Scott Dam and Van Arsdale Reservoir, the Eel River between Cape Horn Dam and the Middle Fork Eel River confluence, and the East Branch Russian River between Potter Valley Powerhouse and Lake Mendocino). The study area also includes areas within 1 mile of the Eel River from the Middle Fork Eel River confluence to the Eel River estuary.

1. Per the requirements of California Assembly Bill 711, beginning July 1, 2019, non-lead ammunition is required when taking any wildlife with a firearm anywhere in California.

This Page Intentionally Left Blank

3.3.5.4 References

Adam, M.D., and J.P. Hayes. 1998. Arborirnus porno. Mammilian Species. 593. 1-5.

Bond, M.L., T.Y. Chi, C.M. Bradley, and D.A. DellaSala. 2022. Forest management, barred owls, and wildfire in northern spotted owl territories. Forests 13: 1,730.

California Nature Center. 2013. A Citizen's Guide to the Tule Elk of California.

CDFW (California Department of Fish and Wildlife). 2024a. Fishing and Hunting Regulations. Available at: https://www.wildlife.ca.gov/regulations.

CDFW (California Department of Fish and Wildlife). 2024b. California Wildlife Habitat Relationships System Database, Version 10.0. CWHR 2023. Available at: https://wildlife.ca.gov/Data/CWHR.

CDFW (California Department of Fish and Wildlife). 2024c. State and Federally Listed Endangered and Threatened Animals of California. April. Available at: https://wildlife.ca.gov/Conservation/CESA.

CDFW (California Department of Fish and Wildlife). 2024d. Fully Protected Species. Available at: https://wildlife.ca.gov/Conservation/Fully-Protected.

CDFW (California Department of Fish and Wildlife). 2024e. Deer Hunting Regulations. Available at: https://wildlife.ca.gov/Hunting/Deer#54773-seasons.

CDFW (California Department of Fish and Wildlife). 1982. The Biopolitics and Management of California Tule Elk.

CNDDB (California Natural Diversity Database). 2024. RareFind5 (Internet), Version 5.3.0. California Department of Fish and Wildlife.

Cornell Lab of Ornithology. 2024. American Goshawk. Available at: https://www.allaboutbirds.org/guide/American_Goshawk/overview#

Forsman, E.D., J.K. Swingle, R.J. Davis, B.L. Biswell, and L.S. Andrews. 2016. Tree voles: an evaluation of their distribution and habitat relationships based on recent and historical studies, habitat models, and vegetation change. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station Report No.: PNW-GTR-948. [accessed 2024 Oct 16]. https://www.fs.usda.gov/treesearch/pubs/53112.

Mayer, K.E., and W.F. Laudenslayer, Jr., eds. 1988. A Guide to Wildlife Habitats of California. State of California Resources Agency, Department of Fish and Game, Sacramento. Available at: https://wildlife.ca.gov/Data/CWHR.

Natural History Museum. 2016. Los Angeles County. North American Mammals, Black-tailed deer. Electronic database accessed November 2016.

PG&E (Pacific Gas and Electric Company). 2023. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2023.

PG&E (Pacific Gas and Electric Company). 2022. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2022.

PG&E (Pacific Gas and Electric Company). 2021. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2021.

PG&E (Pacific Gas and Electric Company). 2019a. TERR 2 – Wildlife Resources Study Data Memorialization, Technical Study Summary. Potter Valley Project (FERC Project No. 77 Relicensing).

PG&E (Pacific Gas and Electric Company). 2019b. Final Potter Valley Project 2014–2019 Bald Eagle Monitoring Report.

PG&E (Pacific Gas and Electric Company). 2014. Final Potter Valley Project 2009–2014 Bald Eagle Monitoring Report.

PG&E (Pacific Gas and Electric Company). 2009. Final Potter Valley Project 2004–2009 Bald Eagle Monitoring Report.

Pease, K.M., A.H. Freedman, J.P. Pollinger, J.E. McCormack, W. Buermann, J. Rodzen, J. Banks, E. Meredith, V.C. Bleich, R.J. Schaefer, K. Jones, and R.K. Wayne. 2009. Landscape genetics of California mule deer (*Odocoileus hemionus*): the roles of ecological and historical factors in generating differentiation. Molecular Ecology 18: 1,848–862.

Slauson, K.M., W.J. Zielinski, and J.P. Hayes. 2007. Habitat Selection by American martens in coastal California. Journal of Wildlife Management 71(2), 458–468.

USFS (U.S. Forest Service). 2024. Forest Planning and Monitoring Datasets. Northwest Forest Plan Region 5 Geospatial Data Portal. Website accessed May 2024. Available at: http://www.fs.usda.gov/detail/r5/landmanagement/gis/?cid=STELPRDB5327165.

USFS (U.S. Forest Service). 2016a. CALVEG Zone 1: North Coast – Mid vegetation maps using the Regional Dominant classification. Website accessed November 2016. Available at: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192.

USFS (U.S. Forest Service). 2016b. Mendocino National Forest wildlife GIS layers. Received March 2016.

USFS (U.S. Forest Service). 2013. Pacific Southwest Region 5 Regional Forester's 2013 Sensitive Animal Species List.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 1986. Mendocino National Forest Proposed Land and Resource Management Plan. Region 5.

USFWS (U.S. Fish and Wildlife Service). 2024. Endangered Species Lists. Sacramento Fish and Wildlife Offices. Available at: https://ecos.fws.gov/ipac//.

USFWS (U.S. Fish and Wildlife Service). 2022. Endangered and threatened wildlife and plants; designation of Critical Habitat for the Coastal Distinct Population Segment of the Pacific marten. Proposed rule; revisions and reopening of comment period. 50 CFR Part 17 (FWS-R8-ES-2020-0151). Available at: http://www.regulations.gov.

USFWS (U.S. Fish and Wildlife Service). 2021a. Birds of Conservation Concern 2021. USFWS Division of Migratory Bird Management. Arlington, Virginia.

USFWS (U.S. Fish and Wildlife Service). 2021b. Endangered and threatened wildlife and plants; designation of critical habitat for the Coastal Distinct Population Segment of the Pacific marten. Proposed Rule. 50 CFR Part 17 (FWS-R8-ES-2020-0151). Available at: http://www.regulations.gov.

USFWS (U.S. Fish and Wildlife Service). 2020. Endangered and threatened wildlife and plants; threatened species status for the Coastal Distinct Population Segment of the Pacific marten with Section 4(d) Rule. Final Rule. 50 CFR Part 17 (FWS-R8-ES-2018-0076). Available at: http://www.regulations.gov.

USFWS (U.S. Fish and Wildlife Service). 2018. Species status assessment report for the coastal marten (*Martes caurina*), Version 2.0. July 2018. Arcata, California.

USFWS (U.S. Fish and Wildlife Service). 2016. Endangered and threatened wildlife and plants; designation of critical habitat for the marbled murrelet. Final rule. 50 CFR Part 17 (FWS-R1-ES-2015-0070). Available at: http://www.regulations.gov.

USFWS (U.S. Fish and Wildlife Service). 2012. Endangered and threatened wildlife and plants; designation of revised critical habitat for the northern spotted owl. Final rule. 50 CFR Part 17 (FWS-R1-ES-2011-0012). Available at: http://www.regulations.gov.

USFWS (U.S. Fish and Wildlife Service). 2011. Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). June 28, 2011. Portland, Oregon.

Walker, F.M., C.H.D. Williamson, D.E. Sanchez, C.J. Sobek, and C.L. Chambers. 2016. Species from Feces: Order-Wide Identification of Chiroptera from Guano and Other Non-Invasive Genetic Samples. PLoS ONE 11(9): e0162342. https://doi.org/10.1371/journal.pone.0162342.

This Page Intentionally Left Blank

Appendix 3.3.5-A

Descriptions of CWHR Wildlife Habitats within 1 Mile of the Potter Valley Project

This Page Intentionally Left Blank

Annual Grassland

John G. Kie
Updated by: CWHR Staff, April 2005

Vegetation

Structure. Annual Grassland habitats are open grasslands composed primarily of annual plant species. Many of these species also occur as understory plants in Valley Oak Woodland (VOW) and other habitats. Structure in Annual Grassland depends largely on weather patterns and livestock grazing. Dramatic differences in physiognomy, both between seasons and between years, are characteristic of this habitat. Fall rains cause germination of annual plant seeds. Plants grow slowly during the cool winter months, remaining low in stature until spring, when temperatures increase and stimulate more rapid growth. Large amounts of standing dead plant material can be found during summer in years of abundant rainfall and light to moderate grazing pressure. Heavy spring grazing favors the growth of summer-annual forbs, such as tarweed and turkey mullein, and reduces the amount of standing dead material. On good sites, herbage yield may be as high as 4900 kg/ha (4400 lb/ac) (Garrison et al. 1977).

Composition. Introduced annual grasses are the dominant plant species in this habitat. These include wild oats, soft chess, ripgut brome, red brome, wild barley, and foxtail fescue. Common forbs include broadleaf filaree, redstem filaree, turkey mullein, true clovers, bur clover, popcorn flower, and many others. California poppy, the State flower, is found in this habitat. Perennial grasses, found in moist, lightly grazed, or relic prairie areas, include purple needlegrass and Idaho fescue. Vernal pools, found in small depressions with a hardpan soil layer, support downingia, meadowfoam, and other species (Parker and Matyas 1981). Species composition is also related to precipitation (Bartolome et al. 1980). Perennial grasses are more common on northern sites with mean annual rainfall greater than 150 cm (60 in). Soft chess and broadleaf filaree are common in areas with 65-100 cm (25-40 in) of rainfall, and red brome and redstem filaree are common on southern sites with less than 25 cm (10 in) of precipitation (Bartolome et al. 1980).

Other Classifications. Annual Grassland habitat has been described as Valley Grassland (Munz and Keck 1959, Heady 1977), Valley and Foothill Grassland (Cheatham and Haller 1975), California Prairie (Küchler 1977), Annual Grasslands Ecosystem (Garrison et al. 1977), Brome grass, Fescue, Needlegrass, and Wild Oats series (Paysen et al. 1980), and Annual Grass-Forb series (Parker and Matyas 1981).

Habitat Stages

Vegetation Changes 1-2:S-D. Annual Grassland habitats occupy what was once a pristine native grassland. The native grassland likely consisted of climax stands of perennial bunchgrasses, such as purple needlegrass, on wetter sites (Bartolome 1981, Bartolome and Gemmill 1981), with annual species existing as climax communities on drier alluvial plains (Webster 1981). Today, plant succession in the classical sense does not occur in Annual Grassland habitats. However, species composition is greatly influenced by seasonal and annual fluctuations in weather patterns. Annual plants germinate with the first fall rains that exceed about 15 mm (0.6 in), growing slowly during winter and more rapidly in spring (Heady 1977). Botanical composition changes throughout the growing season because of differences in plant phenology (Heady 1958). Most annuals mature between April and June (Heady 1977), although some species, such as tarweed and turkey mullein, continue to grow into summer. Fall rains that encourage germination, followed by an extended dry period, favor the growth of deep-rooted forbs (Duncan and Woodmansee 1975), but continuing rainfall favors rapidly growing grasses (Pitt and Heady 1978). Livestock grazing favors the growth of low-stature, spring-maturing forbs, such as filaree (Freckman et al. 1979), and summer annuals, such as turkey mullein (Duncan 1976). Because these are important food plants for many wildlife species, proper levels of livestock grazing are generally beneficial in this habitat. In the absence of livestock, Annual Grassland habitats are often dominated by tall, dense stands of grasses such as ripgut brome (Freckman et al. 1979) and wild oats.

Duration of Stages-- Although Annual Grassland habitats consist largely of non-native annuals, these effectively prevent the reestablishment of native perennials over large areas and now comprise climax communities (Heady 1977). Introduced annuals should be considered naturalized plant species and so managed, rather than as invading species characteristic of poor range sites.

Biological Setting

Habitat. Annual Grassland habitat is found just above or surroundingValley Foothill Riparian (VRI), Alkali Desert Scrub (ASC), Fresh Emergent Wetland (FEW), Pasture (PAS) and all agricultural habitat types, and below Valley Oak Woodland (VOW), Blue Oak Woodland (BOW), Blue Oak-Foothill Pine (BOP), Chamise-Redshank (CRC), and Mixed Chaparral (MCH) habitats. Annual Grassland habitat also borders Coast Oak Woodland (COW), Closed Cone-Pine-Cypress (CPC), Coastal Scrub (CSC), and Eucalyptus (EUC) habitats.

Wildlife Considerations. Many wildlife species use Annual Grasslands for foraging, but some require special habitat features such as cliffs, caves, ponds, or habitats with woody plants for breeding, resting, and escape cover. Characteristic reptiles that breed in Annual Grassland habitats include the western fence lizard, common garter snake, and western rattlesnake (Basey and Sinclear 1980). Mammals typically found in this habitat include the black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, badger, and coyote (White et al.1980). The endangered San Joaquin kit fox is also found in and adjacent to this habitat (U.S. Fish and Wildlife Service 1983). Common birds known to breed in Annual Grasslands include the burrowing owl, short-eared owl, horned lark, and western meadowlark (Verner et al. 1980). This habitat also provides important foraging habitat for the turkey vulture, northern harrier, American kestrel, black-shouldered kite, and prairie falcon.

Physical Setting

Annual Grassland habitat occurs mostly on flat plains to gently rolling foothills. Common soil orders include Entisols and Alfisols (Garrison et al.1977). Entisols are often found at lower elevations on flood plains and swales that receive periodic deposits of alluvium (U.S. Soil Conservation Service1975), and are characterized by little or no pedogenic horizon development. Alfisols occur at higher elevations above the valley floor (Garrison et al.1977). Some Annual Grassland habitats can be found in the drier portion of the southern San Joaquin Valley on Aridisols (Garrison et al. 1977). Climatic conditions are typically Mediterranean, with cool, wet winters and dry, hot summers. The length of the frost free season averages 250 to 300 days (18 to 21 fortnights) (Garrison et al. 1977). Annual precipitation is highest in the north (Redding, 960 mm (38 in)) and north coast (Ukiah, 909 mm (36 in)), decreasing to the south (Sacramento, 430 mm (17 in); Stockton, 339 mm (13 in); Fresno, 259 mm (10 in)), and reaching a minimum in the southern San Joaquin Valley (Bakersfield, 150 mm (6 in)) (Major 1977).

Distribution

Annual Grassland habitat occurs in patches of various sizes throughout the state

Literature Cited

Bartolome, J. W. 1981. Stipa pulchra, a survivor from the California prairie. Fremontia 9(1):3-6.

Bartolome, J. W., M. C. Stroud, and H. F. Heady. 1980. Influence of natural mulch on forage production on differing California annual range sites. J. Range Manage. 33:4-8.

Bartolome, J. W., and B. Gemmill. 1981. The ecological status of Stipa pulchra (Poaceae) in California. Madroño 28:172- 184.

Basey, H. E., and D. A. Sinclear. 1980. Amphibians and reptiles. Pages 13-74 In J. Verner and A. S. Boss, tech. coords. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscrip

Duncan, D. A. 1976. Frequent mowing increases turkey mullein on California foothill rangeland. Calif. Fish and Game 62:82-84.

Duncan, D. A., and R. G. Woodmansee. 1975. Forecasting forage yield from precipitation in California's annual rangeland. J. Range Manage. 28:327-329.

Freckman, D. W., D. A. Duncan, and J. R. Larson. 1979. Nematode density and biomass in an annual grassland ecosystem. J. Range Manage. 32:418-422.

Garrison, G. A., A. J. Bjugstad, D. A. Duncan, M. E. Lewis and D. R. Smith. 1977. Vegetation and environmental features of forest and range ecosystems. U.S. Dep. Agric., For. Serv., Handbook No. 475.

Heady, H. F. 1958. Vegetation changes in the California annual type. Ecology 39:402-416.

Heady, H. F. 1977. Valley grassland. Pages 491-514 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Major, J. 1977. California climate in relation to vegetation. Pages 11 -74 In M. G. Barbour and J. Major, eds., Terrestrial vegetation of California. John Wiley and Sons New York.

Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Pitt, M. D., and H. F. Heady. 1978. Responses of annual vegetation to temperature and rainfall patterns in northern California. Ecology 59:336-350.

Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.

U.S. Fish and Wildlife Service 1983b. San Joaquin kit fox recovery program. U.S. Dep. Interior, Fish and Wildl. Serv. Portland, Ore.

U.S. Soil Conservation Service. 1975. Soil taxonomy a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric., Agric. Handbook.

Verner, J., E. C. Beedy, S. L. Granholm, L. V. Ritter, and E. F. Toth. 1980. Birds. Pages 75-319 In J. Verner and A. S. Boss, tech. coords. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.) Gen. Tech. Rep. PSW-37.

Webster, L. 1981. Composition of native grasslands in the San Joaquin Valley, California. Madroño 28:231-241.

White, M., R. H. Barrett, A. S. Boss, T. F. Newman, T. J. Rahn, and D. F.Williams. 1980. Mammals. Pages 321-424 In J. Verner and A. S. Boss, tech. coords. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv., (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.

Perennial Grassland

John G. Kie
Updated by: CWHR Staff, April 2005

Vegetation

Structure. Perennial Grassland habitats, as defined here, occur in two forms in California: coastal prairie, found in areas of northern California under maritime influence, and relics in habitats now dominated by annual grasses and forbs. The coastal prairie form is described here. Relic perennial grasslands are discussed in the chapter on Annual Grassland habitats (AGS). Species of perennial grasses are also common in Wet Meadow (WTM) and other habitats. Structure in Perennial Grassland habitat is dependent upon the mix of plant species at any particular site. For example, sites with western bracken fern exhibit a taller (to 1.5 m (5 fl)), more vertically diverse structure than those dominated by shorter grasses such as silver hairgrass (10-30 cm (0.3-1.0 ft)). Grazing by domestic livestock or wild herbivores such as Roosevelt elk can substantially alter habitat structure through reduction in plant height and removal of biomass. Average herbaceous production on nine soil series in Humboldt County was estimated to be 170013,000 kg/ha (1500-11,600 lb/ac) (Cooper and Heady 1964).

Composition. Perennial Grassland habitats are dominated by perennial grass species such as California oatgrass, Pacific hairgrass, and sweet vernalgrass. On northern sites near the ocean in Del Norte and Humboldt Counties, common species include California oatgrass, American dunegrass, goldfields, Kentucky bluegrass, and western bracken fern (Heady et al. 1977). Further inland, common species include redtop, silver hairgrass, sweet vernalgrass, English daisy, soft chess, coast carex, orchardgrass, California oatgrass, Idaho fescue, red fescue, Douglas iris, western bracken fern and red clover (Heady et al. 1977). To the south, at Point Lobos State Reserve in Monterey County, dominant species include silver hairgrass, coronaria brodiaea, soft chess, California oatgrass, Pacific hairgrass, snakeroot, gumweed, toad rush, poverty rush, common wood-rush, squawroot, and fiddle dock (Heady et al. 1977).

Other Classifications. Other classifications of Perennial Grassland are Coastal Prairie (Munz and Keck 1959, Cheatham and Haller 1975), Coastal Prairie-Scrub Mosaic (Küchler 1977), and Festuca-Danthonia grassland (Heady et al. 1977). Further, CALVEG (Parker and Matyas 1981) describes perennial grass in the North Interior, South Sierran and Southern Interior Ecological provinces. Perennial grass in each of these regions are more associated with the Wet Meadow (WTM) and Fresh Emergent Wetland (FEW) habitats in the North Interior; WTM, FEW, Lodgepole Pine (LPN), Eastside Pine (EPN), and Jeffrey Pine (JPN) in the South Sierran, and Joshua Tree (JST) and Desert Scrub

(DSC) in the South Interior. If perennial grass is encountered in any of these regions of the State, refer to the appropriate habitat description.

Habitat Stages

Vegetation Changes 1-2.S-D. Historically, factors that have affected Perennial Grassland habitats on the north coast include the introduction of non-native annual plant species, increased grazing pressure, elimination of frequent fires, and cultivation (Heady et al. 1977). Vegetation changes influenced by increased grazing, such as the spread of introduced annuals, were slower to occur on the north coast than in the central valley. Spanish missions did not extend north of Sonoma County, and the Russian settlements at Fort Ross and elsewhere on the north coast maintained few cattle and sheep. However, heavy grazing by Roosevelt elk and frequent use of fire by local Indian tribes may have influenced the successional stages of many Perennial Grassland habitats (Heady et al. 1977).

Duration of Stages. Heavily grazed Perennial Grassland habitat dominated by annual plant species returns to perennial species under reduction in grazing pressure. Heady et al. (1977) suggest a successional sequence of annual forbs, followed by annual grasses and perennial forbs, then by perennial grasses such as hairy oatgrass and common velvetgrass, and ending in a climax community dominated by sweet vernalgrass and Pacific oatgrass. On some sites, Perennial Grassland habitat may give way to Coastal Scrub habitat (CSC) dominated by coyotebush and lupine (Heady et al. 1977). Where Perennial Grassland habitat occurs on sites formerly supporting Douglas-fir (DFR), the establishment of perennial grasses may in some cases prevent succession back to the original forest cover (Gordon Huntington, pers. comm.).

Biological Setting

Habitat. Perennial Grassland habitat in the coastal prairie can be found adjacent to Douglas-fir (DFR), Redwood (RDW), Coastal Oak Woodland (COW), Closed Cone-Pine Cypress (CPC), Coastal Scrub (CSC), Saline Emergent Wildland (SEW), Estuarine (EST), Marine (MAR), Fresh Emergent Wetland (FEW), Valley-Foothill Riparian (VRI), Pasture (PAS), and all agricultural habitats.

Wildlife Considerations. Perennial Grassland provides optimum habitat for many species, including the common garter snake, western terrestrial garter snake (Houck 1979), northern harrier, barn owl, burrowing owl, western kingbird, Say's phoebe, barn swallow, western meadowlark, savannah sparrow, grasshopper sparrow (Harris and Harris 1979), Townsend mole, coast mole, Botta's pocket gopher, western harvest mouse, California vole, long-tailed vole, and Oregon vole (Mossman 1979). In addition, Perennial Grassland often serves as feeding habitat for the turkey vulture, red-tailed hawk, American kestrel, peregrine falcon, western bluebird (Harris and Harris 1979), fringe-tailed bat, big brown bat, striped skunk, coyote, black-tailed jackrabbit, brush rabbit, Roosevelt elk, and black-tailed deer (Mossman 1979).

Physical Setting

Perennial Grassland habitat typically occurs on ridges and south-facing slopes, alternating with forest and scrub in the valleys and on north-facing slopes (Heady et al. 1977). Perennial Grassland habitats are most often found on Mollisols. These soils may grade into Inceptisols to the north, with higher precipitation allowing for leaching of the mollic horizon, and into Alfisols to the south, under drier conditions. On the north coast, Perennial Grassland habitat may occasionally be found on Ultisols which formerly supported Douglas-fir (DFR) habitats, but which have been cleared by humans (Gordon Huntington, pers. comm.).

Climatic conditions are under strong maritime influence. Crescent City in Del Norte County has one of the wettest, coolest, most vegetatively productive climates in California (Major 1977). On the north coast, the length of the frost-free season in adjacent Douglas-fir (DFR) habitat is about 200 days (14 fortnights) (Garrison et al. 1977). Annual precipitation is highest in the north (Crescent City 1777 mm (70 in)), and lower to the south (Point Reyes, 497 mm (20 in); Monterey, 465 mm (18 in)) and inland (Davis, 418 mm (16in)) (Major 1977). Fog, which is common, reduces evapotranspiration, and greatly influences potential natural vegetation.

Distribution

Perennial Grassland habitat of the coastal prairie form occurs along the California coast from Monterey County northward (Küchler 1977). It is found below 1000 m (3280 ft) in elevation and seldom more than 100 km (62 mi) from the coast (Heady et al. 1977). Relic perennial grasses within annual grassland habitat occur in patches throughout the state.

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Cooper, D. W., and H. F. Heady. 1964. Soil analysis aids grazing management in Humboldt County. Calif. Agric. 18:4-5.

Garrison, G. A., A. J. Bjugstad, D. A. Duncan, M. E. Lewis and D. R. Smith. 1977. Vegetation and environmental features of forest and range ecosystems. U.S. Dep. Agric., For. Serv., Handbook No. 475.

Harris, S. W., and L. Harris. 1979 Bird narratives. Vol. II In B. G. Marcot, ed. California wildlife/habitat relationships program. North coast/cascades zone. U.S. Dep. Agric., For. Serv. Six Rivers Natl. Forest, Eureka, Calif.

Heady, H. F., T. C. Foin, M. M. Hektner, D. W. Taylor, M. G. Barbour, and W. J. Barry. 1977. Coastal prairie and northern coastal scrub. Pages 733-760 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Houck, J. W. 1979. Herp narratives. Vol. l In B. G. Marcot ed. California wildlife/habitat relationships program. North coast/cascades zone. U. S. Dep. Agric., For. Serv., Six Rivers Nat'l. Forest, Eureka, Calif.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Major, J. 1977. California climate in relation to vegetation. Pages 11 -74 In M. G. Barbour and J. Major, eds., Terrestrial vegetation of California. John Wiley and Sons New York.

Mossman, A. 1979. Mammal narratives. Vol. III In B. G Marcot, ed. California wildlife/habitat relationships program. north coast/cascades zone. U.S. Dep. Agric. For. Serv., Six Rivers Nat'l. Forest, Eureka, Calif.

Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Irrigated Hayfield

E. Lee Fitzhugh and Ronald F. Schultze

Vegetation

Structure-- Except for 2 to 6 months initial growing period, depending on climate, and soil, this habitat is dense, with nearly 100 percent cover. Average height is about 0.46 m. (1.5 feet) tall. Planted fields generally are monocultures (the same species or mixtures or a few species with similar structural properties). Structure changes to a lower stature following each harvest, grows up again and reverts to bare ground following plowing or discing. Plowing may occur annually, but is usually less often. Layering generally does not occur in this habitat. Unplanted "native" hay fields may contain short and tall patches. If not harvested for a year, they may develop a dense thatch of dead leaves between the canopy and the ground.

Composition-- This habitat includes alfalfa fields and grass hayfields. (Cereal grain fields, whether harvested for hay, grain or straw, should be classified as IGR or DGR.) Alfalfa usually exists unplowed for approximately 3 years or more, followed by a cereal grain crop, vegetables, potatoes or tomatoes for 1-4 years before being planted to alfalfa again. Most hay fields in the warmer parts of California are monocultures of alfalfa. In cooler areas, both alfalfa and introduced grass hay are common and are regularly irrigated. Occasionally, "native" hay fields are irrigated to enhance their productivity. Native hay fields may include introduced grasses and forbs, but they are managed less intensively and contain a variety of naturally-occurring graminoids and forbs as well. Alfalfa fields generally will be monocultures except for weeds and small inclusions of roads and ditches. Roads will be mostly barren, while ditchbanks, if vegetated, will support plants similar to those found in FEW. The mixture of grasses and forbs (mostly legumes) varies according to the region of the state (climate, soils), seed mixture used, tillage, irrigation, years since initial planting, and weed control.

Similar Habitats-- Designation of a grassy hayfield as IRH depends more on management of the site than on plant composition. Hayfields are irrigated, intensively mowed and managed, whereas the same vegetation, allowed to grow in a more natural state might be a sedge, wet meadow, or perennial grassland habitat. Similar CWHR habitats are FEW, PAS, PGR, and WTM. The primary difference is that IRH is irrigated and occasionally plowed, mowed, and planted. PAS may also have these characteristics, but is more intensively grazed than IRH. Montane "native hay" pastures that are irrigated, mowed, and grazed belong in IRH if they are allowed to regrow so that by the end of the growing season and through the winter they have a substantial height of vegetation. Otherwise, they belong in the PAS type.

Other Classifications-- Except in the case of "native hay," agricultural habitats are included only in the U.S. (UNESCO) Vegetation Cover Classification System (USVCCS). IRH would include at least three USVCCS formations corresponding to close-grown herbaceous crops in annual and perennial temperate grassland or forb vegetation categories. IRH could include 10 of the sedge and meadow series of Sawyer and Keeler-Wolf (1995). Most rushes (Cyperus spp.) are included by Sawyer and Keeler-Wolf (1995) in their sedge types. Spikerush (Eleocharis spp.), which they treat separately, is more typically a FEW species, but may occur as inclusions in a larger "native hay" IRH stand.

Habitat Stages

Vegetation Changes-- In warmer areas and on better soils, alfalfa is part of a regular 7-8-year crop rotation. In this setting, alfalfa renews soil nitrogen, improves tilth, and can reduce disease and weeds in the vegetable and grain parts of the rotation. Alfalfa is present for 4 years and is not plowed or disked during this time. Alfalfa also is grown where climate or soil is less adaptable to other crops. An Alfalfa-grain or Alfalfa-potato rotation is common in the Great Basin areas. Alfalfa fields may be plowed every 3-6 years, removing some weedy growth, and replanted to alfalfa. In both alfalfa and grass-hay, tall and short stages are dictated by management more than by plant growth. Grass hayfields vary from annually-planted introduced grasses in warm climates to naturally-occurring perennial grasses and sedges in colder climates. Mixtures of annual and perennial, native and introduced species are common. In some "native" hay fields there can be relatively long periods of continuous inundation, on the order of one or more months, usually in winter or spring. Cattails or bulrushes may invade, but they are controlled by management. Vegetation changes are possible given management direction.

Duration of Stages-- Growth begins during February in Cental Valley alfalfa fields. Alfalfa harvesting occurs 3-4 times per season in intermountain areas, 6-8 times in the Central Valley, and 8-9 times in the Imperial Valley. In the Imperial Valley and the Central Valley, harvesting occurs about monthly during most of the season. At high elevations native hay usually is harvested in June, but later harvesting occurs where owners or managers are concerned about bird nesting. Plowing or discing is infrequent.

Biological Setting

Habitat-- In most areas, rotational field crops, vineyards, or orchards will grow on adjacent areas. Natural plant communities that may occur adjacent to IRH include many flat-land, deep-soil communities from sagebrush and annual grassland to desert grassland, alkali desert scrub or creosote desert scrub, depending on the location. At higher elevations, IRH may be adjacent to coniferous forest types. This habitat sometimes exists where soil, water, or climatic conditions limit growth of other crops. If abandoned, alfalfa fields will be replaced naturally by invasive exotic plants, which may be different from those that occupied the site before tilling. Imperial Valley and Central Valley fields occupying alkaline soils, if abandoned, could revert to patchy saltgrass, salt-tolerant shrubs, and unvegetated alkaline flats. Abandoned intermountain alfalfa fields may revert to cheatgrass and Russian thistle, while native hay fields will develop a dense thatch and decadent plants.

Wildlife considerations-- This habitat provides a high quality seasonal resource for blackbirds, deer, doves, egrets, elk, foxes, garter snakes, gophers, gopher snakes, hawks, king snakes, owls, pronghorn, sandhill cranes, voles, waterfowl, and others. However, where harvesting is constant, reproduction values for ground-nesting species are reduced to zero. If rotational cropland is adjacent, this habitat can provide cover during seasonal discing and planting on the rotated fields.

Physical Setting

This habitat occurs in variable climates, from hot and dry to cool and wet to cold and snowy. IRH requires relatively flat topography that allows irrigation or water-spreading. Soils are highly variable but usually more than 1 meter (3.3 feet) deep and often of alluvial origin.

Distribution

This habitat is found throughout California from below sea level to about 2100 m.(7,000 feet). Typical examples are found in Imperial Valley and Modoc County, representing different extremes, and in San Joaquin County, representing a more central form. Agricultural databases that could be used to represent abundance and distribution do not define IRH as we do, and can provide misleading estimates. However, our best estimate, based on a Natural Resources Conservation Service (NRCS 1997) tabulation of Agricultural Commissioners' crop reports for 1996 is that California supports more than 405,000 ha.(1,000,000 acres) of hayfields.

Literature Cited

NRCS. Unpublished. Crop residue management survey: worksheet for 1997, based on Agricultural Commissioners' Agricultural Crop Reports for 1996. USDA, Natural Resources Conservation Service, Davis, CA.

Saline Emergent Wetland

Paul F. Springer

Vegetation

Structure-- Saline Emergent Wetlands (SEW) are characterized as salt or brackish marshes consisting mostly of perennial graminoids and forbs, the latter often succulent and suffrutescent, ranging in height from 0.2 to 2 m (0.7-6.6 ft) or more (Munz and Keck 1973, Cheatham and Haller 1975, Küchler 1977), along with algal mats on moist soils and at the base of vascular plant stems (Küchler 1977, Zedler 1982). The component plants occur sometimes in zones but more often in patches or as a sequence of overlapping species along an elevational gradient (Vogl 1966, Macdonald 1977a, Zedler 1982). Vegetational coverage is complete or nearly so except where creeks and ponds are present or following disturbance (Pestrong 1972, Küchler 1977, Zedler 1982). Vertical stratification occurs in all but the lower, outer zone.

Composition-- Characteristic or distinctive vascular plant species ranging from lower saline sites to higher or brackish sites are cordgrass, pickleweed, Humboldt cordgrass, glasswort, saltwort, jaumea, California seablite, seaside arrowgrass, alkali heath, seashore saltgrass, spearleaf saltweed, shoregrass, the endangered birdsbeak, common glasswort, sea-lavender, brass-buttons, saltmarsh dodder, gumweed, salt rush, tufted hairgrass, Pacific alkali bulrush, Olney bulrush, tule bulrush, California bulrush, common cattail, tropical cattail, cinquefoil, and coast carex (Macdonald and Barbour 1974, Cheatham and Haller 1975, Macdonald 1977a, Zedler 1982, U.S. Fish and Wildlife Service 1983a, Spicher and Josselyn 1985(Spicher and Josselyn not in Habitat Lit Cite). Algae include greens, bluegreens, and diatoms (Zedler 1982).

Other Classifications-- Other names for Saline Emergent Wetlands include coastal salt marsh (2-Munz and Keck 1973, 5.21-Cheatham and Haller 1975, 3-Thorne 1976, 38-Küchler 1977, Macdonald 1977a, Zedler 1982); tidal marsh-3a, salt-flat succulent-3b (Thorne 1976); saltwater marsh, saltwater coastal flat (U.S. Army Corps of Engineers 1978); pickleweed-cordgrass, pickleweed, cattail-sedge, sedge-rush (Parker and Matyas 1981); cordgrass, pickleweed, suaeda, saltgrass, bulrush (Paysen et al. 1980), estuarine intertidal emergent wetland (Cowardin et al. 1979, Jones and Stokes Assoc., Inc. 1981); intertidal estuarine zone-emergent vegetation-2.1.2 C, above tide estuarine wetland zone: diked marsh-2.1.3.A (Proctor et al. 1980); regularly folded saltmarshes-18, irregularly flooded salt marshes-17, salt meadows-16, salt flats-15 (Martin et al. 1953); salt marsh, brackish marsh (Mason 1957, Faber 1982); salt-water marsh, seasonally salt-water marsh (Mason 1957); coastal brackish marsh-5.22 (Cheatham and Haller 1975); tule marsh-37

(Küchler 1977).

Habitat Stages

Vegetation Changes-- 1-2;S-D. Saline Emergent Wetland becomes established as low marsh on intertidal flats and advances seaward as plant detritus and sediments accrete, gradually causing a change to high marsh (Macdonald 1977a). Conversely, high marsh can extend landward as sea level rises (Atwater et al. 1979, Krone 1982, Josselyn 1983). This habitat may exist as any of classes 1-2:S-D. Plant height is greater in the outer, lower zone, ranging from 1 to 1.5 m (3.3-4.9 ft) if cordgrass is present (Purer 1942, Zedler 1982). At higher elevations, height generally varies from 0.2 to 0.7 m (0.7-2.3 ft) (Purer 1942), but barren flats may occur in the south (Macdonald 1977a). In brackish marshes, height ranges up to 2 to 4 m (6.6-13.1 ft) (Cheatham and Haller 1975, Josselyn 1983).

Duration of Stages-- Many parts of present day Pacific Coast salt marshes are believed to be of relatively recent (100 years) origin (Macdonald and Barbour 1974). However, high marsh has remained stable for periods of at least 770 years in Oregon, and comparable marshes existed along the coast during the Pleistocene (Macdonald 1977b). Influencing factors are sedimentation rates and coastal submergence or emergence rates (Macdonald 1977a,b, Zedler 1982). Sedimentation rates have increased from 0.1 cm (0.04 in) /yr before European settlement to 0.2 to 0.5 cm (0.08-0.2 in)/yr in the 1900's because of greater human-induced erosion of uplands (Macdonald 1977a, Zedler 1982). For the last several thousand years, submergence rates from the rise in sea level in the San Francisco Bay Area have averaged 0.1 to 0.2 cm (0-04-0.08 in)/yr (Josselyn 1983).

Other factors affecting wetland duration are diking, ditching, dredging, filling, hydraulic mining, and diversion or impoundment of water upstream, trampling, and pollution (U.S. Fish and Wildlife Service 1979, Atwater et al. 1979, Zedler 1982).

Biological Setting

Habitat-- Saline Emergent Wetlands occur above intertidal sand and mud flats (Küchler 1977) and below upland communities not subject to tidal action (Macdonald 1977a). The upper part of estuaries grade into brackish and freshwater marshes (Cheatham and Haller 1975, Macdonald 1977a, Josselyn 1983).

Wildlife Considerations-- Saline Emergent Wetlands provide food, cover and nesting and roosting habitat for a variety of birds, mammals, reptiles, and amphibians (Macdonald 1977b, Zedler 1982). Endemic subspecies of birds include the endangered California and light-footed clapper rails, California black rail, salt marsh yellowthroat, Belding's Savannah sparrow and three subspecies of the song sparrow at San Francisco Bay (California Department of Fish and Game 1980, U.S. Fish and Wildlife Service

1983a, Josselyn 1983). Other bird species that feed or roost in these wetlands are herons, egrets, ducks, hawks (including the northern harrier), Virginia rail, American coot, shorebirds, swallows, and marsh wren. Some species are residents; others are migrants or winter visitants (Macdonald 1977b, Springer 1982, Zedler 1982, Josselyn 1983). Characteristic mammals are species of shrews, bats, and mice, including the endangered salt marsh harvest mouse endemic at San Francisco Bay, as well as the raccoon, mink, river otter, and harbor seal (Macdonald 1977b, Hall 1981, Springer 1982, Zedler 1982, Josselyn 1983). A number of species from adjacent uplands visit the wetlands to feed (Macdonald 1977b). Several species of lizards and snakes frequent the edge of the high marsh, whereas the Pacific tree frog and western toad occur in slightly brackish marsh or after heavy rains (Macdonald 1977b, Zedler 1982).

Physical Setting

Saline Emergent Wetlands occur along the margins of bays, lagoons, and estuaries sheltered from excessive wave action (Macdonald and Barbour 1974). At their lower margin they are exposed once every 24 hours; whereas, at their upper margin, submergence is short and infrequent, followed by weeks or months of continuous exposure (Macdonald 1977a). Soil salinity varies from that of seawater (35 ppt) or greater (60 ppt up to 145 ppt) because of lagoon closure and evaporation, particularly in the south, to brackish (< 5 ppt) at sites influenced by heavy precipitation and run-off (Macdonald 1977a, Zedler 1982, Josselyn 1983). Soils consist of thin veneers (0.2 to 1.8 m, or 0.7-5.9 ft) of fine silts (<4 microns in diameter), clays, and scattered plant remains. Grain size increases at higher elevations in the south. Soil moisture decreases with increasing elevation; whereas soil organic content appears to increase in the north and decrease in the south (Macdonald 1977a, Zedler 1982). Average rainfall ranges from 20 cm (8 in) in the extreme south (Zedler 1982) to 200 cm (80 in) in the extreme north (Proctor et al. 1980). Seasonal and diurnal temperatures fluctuate little, with mean summer maxima of 16 to 22 C (61-72 F) and mean winter minima of 4 to 8 C (3947 F). Frost-free days range from 330 to 365 (Munz and Keck 1973).

Distribution

Saline Emergent Wetlands occur in the upper intertidal zone from about the level of mean lower high water to extreme high water (Macdonald 1977a). Maximum elevation is about 3.1 m (10.3 ft) above mean lower low water (Hinde 1954) or 1 m (3.3 ft) above mean high water (Harvey et al. 1978). Brackish marsh wetlands extend to below mean lower low water (Josselyn 1983). These wetlands are present in suitable locations along the entire coast, the largest stands occurring in San Francisco Bay.

Literature Cited

Atwater, B. F., S. G. Conard, J. N. Dowden, C. W. Hedel, R. L. MacDonald, and W. Savage.1979. History, landforms, and vegetation of the estuary's tidal marshes.

Pages 347-385 In T. J. Conomos, ed. San Francisco Bay: the urbanized estuary. Pacific Div., Amer. Assoc. for the Advancement of Science. San Francisco.
California Department of Fish and Game. 1980. At the crossroads a report on the status of California's endangered and rare fish and wildlife. California Dep. Fish and Game, Sacramento.
Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript
Cowardin, L. M. V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/31.
Faber, P. M. 1982. Common wetland plants of coastal California. Pickleweed Press, Mill Valley, Calif.
Hall, E. R. 1981. The mammals of North America. 2nd ed. John Wiley and Sons, New York.
Harvey, H. T., M. J. Kutilek, and K. M. DiVittorio. 1978. Determination of transition zone limits in coastal California wetlands. San Jose State Univ., San Jose, Calif.
Hinde, H. P. 1954. The vertical distribution of salt marsh phanerogams in relation to tide levels. Ecol. Monogr. 24:209-225.
Jones & Stokes Associates, Inc. 1981. An ecological characterization of the central and northern California coastal region. Vol. III, Part 1 (habitats) and 2 (community composition lists). U.S. Dep. Interior, Fish and Wild. Serv., Biol. Serv. Prog. FWS/OBS-80/47.1 and 47.2.
Josselyn, M. 1983. The ecology of San Francisco Bay tidal marshes: A community profile. U. S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS-83/23.
Krone, R. B. 1982. Engineering wetlands: Circulation sedimentation, and water quality. Pages 53-58 In M. Josselyn (ed.). Wetland restoration and enhancement in California. Calif. Sea Grant Col. Prog. Rep. No. T-CSGCP-007.
Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.
Macdonald, K. B. 1977a. Coastal salt marsh. Pages 263-294. In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.
Macdonald, K. B. 1977b. Plant and animal communities of Pacific North American salt marshes. Pages 167-191 In V. J. Chapman, ed. Wet coastal ecosystems. Elsevier Scientific Publ. Co., Amsterdam.
Macdonald, K. B., and M. G. Barbour,1974. Beach and salt marsh vegetation of the North American Pacific coast. Pages 175-233 In R. J. Reimold and W. H. Queen, eds. Ecology of halophytes. Academic Press, New York.
Martin, A. C., N. Hotchkiss, F. M. Uhler, and W. S. Bourn. 1953. Classification of wetlands of the United States. U. S. Dep. Interior, Fish and Wildl. Serv. Spec. Sci. Rep. Wildl. 20.
Mason, H. L 1957. A flora of the marshes of California. Univ. of California Press, Berkeley.
Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. Univ. of California Press, Berkeley.
Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian

vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.
Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.
Pestrong, R. 1972. San Francisco Bay tidelands. Calif. Geology 25:27-40.
Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.
Purer, E. A. 1942. Plant ecology of the coastal salt marshlands of San Diego County, California. Ecol. Monogr. 12:81 -111.
Springer, P. F. 1982. The bird and mammal resources of Humboldt Bay. Pages 60-67 In C. Toole and C. Diebel, eds. Proc. of the Humboldt Bay Symp., Eureka, Calif.
Thorne, R F. 1976. The vascular plant communities of California. Pages 1-31 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. 2.
U.S. Army Corps of Engineers. 1978. Preliminary guide to wetlands of the West Coast states. U.S. Army Waterway Expr. Sta. Tech. Rep. Y-78-4.
U.S. Fish and Wildlife Service. 1979. Concept plan for waterfowl wintering habitat preservation, California coast. U.S. Dep. Interior, Fish and Wildl. Serv. Portland, Ore.
U.S. Fish and Wildlife Service. 1983a. Republication of the lists of endangered and threatened species. Federal Register 48:34182-34196.
Vogl, R. J.1966. Salt-marsh vegetation of Upper Newport Bay, California. Ecology 47:80-87.
Zedler. J. B. 1982. The ecology of southern California coastal salt marshes: a community profile. U. S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS-81/54.

Chamise-Redshank Chaparral

A. Sidney England

Vegetation

Structure-- Fire occurs regularly in Chamise-Redshank Chaparral and influences habitat structure. Mature Chamise-Redshank Chaparral is single layered, generally lacking well-developed herbaceous ground cover and overstory trees. Shrub canopies frequently overlap, producing a nearly impenetrable canopy of interwoven branches. Chamise-dominated stands average 1 to 2 m (3.3 to 6.6 ft) in height, but can reach 3 m (9.8 ft) (Horton 1960, Cheatham and Haller 1975, Hanes 1977). Total shrub cover frequently exceeds 80 percent, but may be considerably lower on extremely xeric sites with poor soils (Minnich 1976, Vogl 1976, Hanes 1977). Redshank stands are slightly taller, averaging 2 to 4 m (6.6 to 13.1 ft) but occasionally reaching 6 m (19.7 ft) (Hanes 1965, 1977, Cheatham and Haller 1975). Mature redshank frequently is more open than chamise and can have sparse herbaceous cover between shrubs (Hanes 1965, 1977, Paysen et al. 1980).

Composition-- Chamise-Redshank Chaparral may consist of nearly pure stands of chamise or redshank, a mixture of both, or with other shrubs. The purest stands of chamise occur on xeric, south-facing slopes (Hanes 1976). Toyon, sugar sumac, poison oak, redberry, and California buckthorn are commonly found in drainage channels and on other relatively mesic sites (Vogl 1976). At upper elevations or on more mesic exposures, chamise mixes with ceanothus, manzanita, scrub oak, and laurel sumac (Horton 1960, Hanes 1976, Parker and Matyas 1981). Ceanothus and sugar sumac are common associates of redshank (Hanes 1965, 1977). In southern California, white sage, black sage, and California buckwheat are common at lower elevations and on recently disturbed sites (Hanes 1965, 1977). Distinguishing Chamise-Redshank Chaparral from Mixed Chaparral (MCH) and Coastal Scrub (CSC) is a subjective interpretation based on percent cover by chamise and redshank and time since last burn. Paysen et al. (1980) classify chaparral as chamise or redshank if either species is "dominant". Hanes (1977) considers a stand to be chamise if it comprises 50 to 100 percent of total cover and redshank if it comprises 20 to 50 percent of total cover. For purposes of this description and the WHR model (Salwasser and Laudenslayer 1982), a more complex definition is needed which reflects changes in species composition that occur during post-fire recovery and aging. A stand of brush is classified as Chamise-Redshank Chaparral, as opposed to Mixed Chaparral, if any of the following criteria are fulfilled.

1. Any stand with greater than 60 percent relative shrub cover by chamise and redshank.
2. Young stands recovering from fire with greater than 20 percent absolute shrub cover

by chamise and redshank, and greater than 75 percent relative shrub cover by these species and relatively short-lived subshrubs such as yerba santa.
3. Any stand with at least 50 percent relative shrub cover by chamise and redshank and greater than 75 percent relative shrub cover by these species and shrubs of intermediate life span such as several species of ceanothus.

Other Classifications-- Most plant ecologists treat stands dominated by chamise and redshank as distinct types (Cheatham and Haller 1975, Thorne 1976, Hanes 1977, Paysen et al. 1980, Parker and Matyas 1981). Horton (1960) further divides chamise into "pure chamise" and "chamise-ceanothus" to reflect the frequent occurrence of mixtures of these shrubs. The Californian mixed chaparral of Cheatham and Haller (1975) includes many stands of Chamise-Redshank Chaparral that also support a significant component of ceanothus and other shrubs.

Habitat Stages

Vegetation Changes-- 1;24:S-D. Fire is the primary disturbance initiating secondary succession in Chamise-Redshank Chaparral. Annuals, perennial herbs, and subshrubs are abundant for several years after a fire. Shrubs begin to appear either as seedlings or root-crown sprouts beginning the first growing season after burning (Hanes 1971). As the habitat matures, shrub cover and height increase and herbaceous cover declines (Hanes 1971). Relatively short-lived shrubs and subshrubs, such as California buckwheat, common deerweed, and most species of ceanothus, may be absent or rare in older stands (Horton and Kraebel 1955, Hanes 1977). After each fire, populations of these species and post-fire herbs regenerate quickly from the seed bank in the soil (Sweeney 1956). In old unburned stands, species diversity is low, growth rates are slow, long-lived shrubs accumulate dead material, and some shrubs may die (Hanes 1971, Rundel and Parsons 1979).

Duration of Stages-- The general schedule of post-fire recovery in chaparral is described by Menke and Villaseñor (1977) and Zedler (1977). Herbaceous cover is dominant for 1 to 3 years. Long- and short-lived shrubs increase in height and cover but canopies generally do not overlap for 3 to 15 years after fire. From 10 to 30+ years, short-lived shrubs die, shrub cover increases, the canopy closes, and dead material begins to accumulate. Rundel and Parsons (1979) found that, in the Sierra Nevada, chamise growth rates declined and accumulation of dead material began after 16 years. Time to senescence is dependent on local site characteristics. In southern California, Hanes (1977) considers chamise older than 60 years to be senescent, but this may occur in 20 to 25 years in northern California (Sampson 1944). Horton (1960) states that pure chamise in the San Bernardino Mountains reaches 25 percent cover in 10 years, 50 percent in 40 years, and 70 percent in 55 years. However, recovery rates and peak cover vary with soil type, climatic regime, and slope. For example, most mesic sites supporting chamise and ceanothus reach 50 percent cover in 10 years and 90 percent cover in 25 years. Some sites may reach 90percent cover in 10 years (T. E. Paysen, pers. comm.). At 50 years, shrub cover in mixed stands of chamise and ceanothus may decline to 80 percent total shrub cover as ceanothus dies (Hanes 1977).

Biological Setting

Habitat-- Chamise-Redshank Chaparral generally occurs below and grades into Mixed Chaparral (MCH). On some sites, Chamise-Redshank Chaparral may form an ecotone with Ponderosa Pine (PPN), Coastal Oak Woodland (COW), or mixed conifer types. In northern California, the lower boundary is with Annual Grassland (AGS) and Blue Oak-Foothill Pine (BOP). In southern California, Coastal Scrub (CSC) may form a broad mosaic with Chamise-Redshank Chaparral. Location of the boundary can depend on fire frequency (Hanes 1971). On desert exposures, redshank stands may occur above either Mixed Chaparral (MPC) or Desert Succulent Scrub (DSC) and either above or below Pinyon-Juniper (PJN).

Wildlife Considerations-- Wildlife species found in this habitat type also are found in either Mixed Chaparral (MCH), Montane Chaparral (MCP), Coastal Scrub (CSC) or Sagebrush (SGB) and in shrubs beneath several woodland and forest types. The primary land management consideration is selection of alternative fire management treatments. Long-term fire suppression can lead to stand senescence (Vogl 1977) and declines in deer (Biswell et al. 1952), small mammals (Quinn 1979), birds (Wirtz 1979), and reptiles (Simovich 1979). Most animal populations reach peak densities in the first two or three decades, frequently 1 to 15 years, after a fire. Repeated fires at short intervals could favor crown-sprouting shrubs over obligate seed sprouters (Vogl 1977). Either management extreme could have long-term impacts on wildlife through changes in nutrient availability, soil quality or vegetation composition, structure, and recovery time. Prescribed burning can be an effective management tool, but the effects vary with season of burn (Rundel 1982). Post-fire herbs may be important in immobilizing nitrogen within the chaparral system (Rundel and Parsons 1980). Protecting these herbs from grazing may be important for effective long-term habitat maintenance (Rundel 1982). Populations of most small vertebrates decline sharply or are eliminated when chaparral is converted to grassland (Lillywhite 1977). Active and passive chaparral management programs must tailor management prescriptions to specific site characteristics and project goals.

Physical Setting

Chamise-dominated stands are most common on south- and west-facing slopes; redshank is found on all aspects (Hanes 1965, 1977, Cheatham and Haller 1975). Soils usually are thin with little accumulation of organic material (Cheatham and Haller 1975). Chamise may be a dominant shrub on some serpentine sites (Parker and Matyas 1981). Chamise-Redshank Chaparral is found in a mediterranean climate; rainfall is 38 to 63 cm (15 to 25 in), less than 20 percent of total precipitation falls in summer, and winters are mild (Oruduff 1974). The predominant land forms are steep slopes and ridges (Thorne 1976).

Distribution

Hanes (1977) provides a good description of "chamise" and "redshank" chaparral distributions in California. This habitat is usually found below 1200 m (4000 ft) on mountain ranges outside the deserts (Cheatham and Haller 1975, Vogl 1976, Minnich 1976, Hanes 1977, Parker and Matyas 1981). Large nearly pure areas of redshank-dominated chaparral occur in the interior valleys of the peninsular mountain ranges of Riverside and San Diego counties; isolated stands are found in the Santa Monica Mountains and in northern Santa Barbara and San Luis Obispo counties (Cheatham and Haller 1975, Hanes 1977).Chamise is the dominant shrub of this habitat type throughout the rest of the state. Nearly mature stands of chamise cover large areas in the peninsular and transverse ranges and Tehachapi Mountains of southern California. To the north, chamise more frequently mixes with other shrubs, especially several species of ceanothus. This type of vegetation covers large areas in the central coast ranges and on the eastern exposures of the north coast ranges; as isolated stands in the Cascade and Klamath ranges and the Siskiyou Mountains; and in a broken band on the western slope of the Sierra Nevada (Hanes 1977, Parker and Matyas 1981).

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Horton, J. S. 1960. Vegetation types of the San Bernardino Mountains, California. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Tech. Pap. No. 44.

Hanes, T. L. 1965. Ecological studies on two closely related chaparral shrubs in southern California. Ecol. Monogr. 35:213-235.

Hanes, T. L. 1971. Succession after fire in the chaparral of southern California. Ecol. Monogr. 41:27-52.

Hanes, T. L. 1976. Vegetation types of the San Gabriel Mountains. Pages 65-76 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. No. 2.

Hanes, T. L. 1977. California chaparral. Pages 417-469 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Horton, J. S., and C. J. Kraebel. 1955. Development of vegetation after fire in the chamise chaparral of southern California. Ecology 36:244-262.

Lillywhite, H. B. 1977. Effects of chaparral conversion on small vertebrates in southern California chaparral. Biol. Cons. 11:171-184.

Menke, J. W., and R. Villasenor. 1977. The California Mediterranean ecosystem and its management. Pages 257-270 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv., Gen. Tech. Rep. W0-3.

Minnich, R. A. 1976. Vegetation of the San Bernardino Mountains. Pages 99-124 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. No. 2.

Ornduff, R. 1974. Introduction to California plant life. Univ. Of California Press, Berkeley.
Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.
Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.
Quinn, R. D. 1979. Effects of fire on small mammals in the chaparral. Cal-Neva Wild]. Trans. 1979:125-133.
Rundel, P. W. 1982. Successional dynamics of chamise chaparral: the interface of basic research and management. Pages 86-90 In C. E. Conrad and W. C. Oechel, tech. cords. Dynamics and management of Mediterranean-type ecosystems. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.) Gen. Tech. Rep. PSW-58.
Rundel, P. W., and D. J. Parsons. 1979. Structural changes in chamise (Adenostoma fasciculatum) along a fire-induced age gradient. J. Range Manage. 32:462-466.
Rundel, P. W., and D. J. Parsons. 1980. Nutrient changes in two chaparral shrubs along a fire-induced age gradient. Amer. J. Bot. 67:51-58.
Sampson, A. W. 1944. Plant succession on burned chaparral lands in northern California. Univ. Calif. Agr. Exp. Sta. Bull. 685.
Simovich, M. 1979. Post-fire reptile succession. ,Cal-Neva Wildl. Trans. 1979:104-113.
Sweeney, J. R. 1956. Responses of vegetation to fire: a study of the herbaceous vegetation following chaparral fires. Univ. Calif. Publ. Bot. 28:143-250.
Thorne, R F. 1976. The vascular plant communities of California. Pages 1-31 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. 2.
Vogl, R. J. 1976. An introduction to the plant communities of the Santa Ana and San Jacinto Mountains. Pages 77-98 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. No. 2.
Vogl, R. J. 1977. Fire frequency and site degradation. Pages 193-201 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv. Gen. Tech. Rep. W0-3.
Wirtz, W. O., II. 1979. Effects of fire on birds in chaparral. Cal-Neva Wildl. Trans. 1979:114-124.
Zedler, P. H. 1977. Life history attributes of plants and the fire cycle: a case study in chaparral dominated by Cypressus forbesii. Pages 451-458 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv. (Washington, D.C.) Gen. Tech. Rep. W0- 3.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Mixed Chaparral

A. Sidney England

Vegetation

Structure-- Mixed Chaparral (MCH) is a structurally homogeneous brushland type dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. Shrub height and crown cover vary considerably with age since last burn, precipitation regime (cismontane vs. transmontane), aspect, and soil type (Hanes 1977). At maturity, cismontane Mixed Chaparral typically is a dense, nearly impenetrable thicket with greater than 80 percent absolute shrub cover. Canopy height ranges from 1 to 4 m (3.3 to 13.1 fl), occasionally to 6 m (19.6 fl) (Horton 1960, Cheatham and Haller 1975, Hanes 1977). On poor sites, serpentine soils or transmontane slopes, shrub cover may be only 30 to 60 percent and shrubs may be shorter, 0.5 to 3.0 m (1.6 to 9.8 fl) (Cheatham and Haller 1975, Hanes 1976, 1977). Considerable leaf litter and standing dead material may accumulate in stands that have not burned for several decades.

Composition-- Mixed Chaparral is a floristically rich type that supports approximately 240 species of woody plants (Oruduff 1974). Composition changes between northern and southern California and with precipitation regime, aspect, and soil type. Dominant species in cismontane Mixed Chaparral include scrub oak, chaparral oak, and several species of ceanothus and manzanita. Individual sites may support pure stands of these shrubs or diverse mixtures of several species. Commonly associated shrubs include chamise, birchleaf mountain mahogany, silk-tassel, toyon, yerba-santa, California buckeye, poison-oak, sumac, California buckthorn, hollyleaf cherry, Montana chaparral-pea, and California fremontia. Some of these species may be locally dominant. Leather oak and interior silktassel are widely distributed on cismontane serpentine soils, and chamise and toyon may be abundant on these soils. Shrubs such as Jepson, coyote, and dwarf ceanothus and serpentine manzanita are local serpentine endemics (Cheatham and Haller 1975, Thorne 1976, Hanes 1977). Incense-cedar, knobcone pine, Coulter pine, and foothill pine frequently are found in Mixed Chaparral on serpentine soils (Thorne 1976).

Shrub live oak, desert ceanothus, and desert bitterbrush are examples of shrubs found in Mixed Chaparral only on transmontane slopes (Cheatham and Haller 1975, Thorne 1976, Hanes 1977, and Zabriskie 1979). However, many species found in cismontane stands are also common on desert-facing slopes. Examples include bigberry manzanita, chamise, birchleaf mountain mahogany, California fremontia, and several species of ceanothus.

Other Classifications-- Most authors divide Mixed Chaparral into several types based on the dominant floristic component, soil type or location. Cheatham and Haller (1975) recognize Californian mixed, south coastal, semi-desert, and serpentine chaparrals. Thorne (1976) identifies mixed chaparral but separates serpentine and desert transition chaparral as distinct types. Paysen et al. (1980) subdivide this type into 7 series (ceanothus, mountain mahogany, scrub oak, prunus, sumac, manzanita, and toyon) based on the dominant or codominant shrub components. Hanes (1977) gives a good review and description of 6 Mixed Chaparral types (ceanothus, scrub oak, manzanita, serpentine, desert, and woodland) .

Habitat Stages

Vegetation Changes-- 1;24.S-D. Post-fire recovery of Mixed Chaparral begins with a cover of subshrubs, annuals, and perennial herbs. However, shrubs that will be dominant in mature chaparral are present as seedlings and root-crown sprouts. As shrub cover and height increase with age, herbaceous cover declines. Long-lived seeds remaining in the soil produce the herbaceous cover following the next fire (Sweeney 1956). Shrub species composition also may change as the stand ages. Yerba-santa, common deerweed, and many ceanothus are examples of relatively short-lived (< 40 years) shrubs and subshrubs that disappear from stands that have not been burned for decades (Horton and Kraebel 1955, Hanes 1971, 1977). Long-lived shrubs in very old stands become senescent, accumulating standing dead material, and some individual may die.

Some authors (e.g., Thorne 1976) have suggested that Mixed Chaparral might succeed to an oak woodland if protected from fire for extremely long periods. Others (e.g., Minnich 1976) have failed to find evidence to support this notion. Hanes (1977) suggests that confusion may result from inadequate distinction among vegetation types with different species compositions, soil qualities, slopes, aspects, and precipitation regimes.

Duration of Stages-- Menke and Villaseñor (1977) and Zedler (1977) give good descriptions of the chaparral post-fire recovery schedule. For the first 1 to 3 years, cover is dominated by short-lived herbs and subshrubs; shrubs are present as seedlings and root-crown sprouts. From 3 to 15 years, herbaceous species disappear as shrubs and subshrubs enlarge, but shrub canopies generally do not touch. From approximately 10 to 30+ years after a burn, shrub cover increases, canopies begin to overlap, relatively short-lived shrubs begin to die, and dead material accumulates. Stands more than 25 to 35 years old eventually can become senescent. The post-fire recovery schedule varies with species composition, slope, aspect, elevation, and soil type. Shrub regeneration is quicker on more mesic sites. In southern California, stands dominated by manzanita, ceanothus, and scrub oak reach 50 to 60 percent cover in 10 years and 80+ percent cover in 25 to 30 years (Horton 1960, Vogl 1976, Pase 1982b). Recovery time usually is shorter in northern California. Stands of Chamise-Redshank Chaparral (CRC) can become extremely senescent in 60 to 90 years; some Mixed Chaparral types may take 2 to 3 times longer (Hanes 1982).

Biological Setting

Habitat-- Mixed and Chamise-Redshank Chaparral (CRC) occur as a mosaic on low to middle elevation slopes below several woodland and forest types. Compared to Chamise-Redshank Chaparral, Mixed Chaparral generally occupies more mesic sites at higher elevations or on north-facing slopes. In southern California, Coastal Scrub (CSC) may form the lower chaparral boundary (Hanes 1977). In northern California, Mixed Chaparral merges with Annual Grassland (AGS) and Blue Oak-Foothill Pine (BOP) at lower elevations. Chaparral shrubs form the understory of many Blue Oak-Foothill Pine stands. At upper elevations, Mixed Chaparral grades into Coastal Oak Woodland (COW), Ponderosa Pine (PPN) or mixed conifer types and frequently forms the understory of these habitats. On desert exposures, Desert Scrub (DSC), Desert Succulent Scrub (DSS) or Joshua Tree (JST) may be found below Mixed Chaparral. Jeffrey Pine (JPN), Pinyon-Juniper (PJN) or Juniper (JUN) habitats occur above Mixed Chaparral.

Wildlife Considerations-- No wildlife species are restricted to Mixed Chaparral. Most species are found in other shrub-dominated types including Chamise-Redshank Chaparral (CRC), Montane Chaparral (MCP), Coastal Scrub (CSC), and Sagebrush (SGB), or the shrubs beneath several woodland and forest types. Wildlife management considerations usually focus on selecting alternative fire management treatments. Potential impacts of management actions in Mixed Chaparral generally are similar to Chamise-Redshank Chaparral.

Physical Setting

Mixed Chaparral occurs on all aspects, but at lower elevations, it generally is found on north-facing slopes. This pattern is especially true in southern California. Generally, it occurs on steep slopes and ridges with relatively thin, well-drained soils (Oruduff 1974, Cheatham and Haller 1975). Soils can be rocky, sandy, gravelly or heavy (Cheatham and Haller 1975, Thorne 1976). Mixed Chaparral occurs on sites with deeper and more mesic soils than Chamise-Redshank Chaparral (Cheatham and Haller 1975). Serpentine soils are high in several potentially toxic substances, such as iron and magnesium, and low in required nutrients, including calcium (Whittaker 1975). The mediterranean climate is characterized by cool, wet winters and hot, dry summers. Total rainfall is 38 to 63 cm (15 to 25 in) with less than 20 percent falling during the summer (Oruduff 1974).

Distribution

Mixed Chaparral generally occurs below 1520 m (5000 ft) on mountain ranges throughout California except in the deserts (Cheatham and Haller 1975, Parker and Matyas 1981). Upper and lower elevational limits vary considerably with precipitation regime, aspect, and soil type. Mixed Chaparral occurs throughout the transverse, peninsular, and central coast ranges and the Tehachapi Mountains. In the Sierra Nevada, this type is a broken band along middle and lower elevations of the western slope. It also occupies large areas in the north coast ranges, especially on interior slopes, and is found as large discontinuous patches in the Siskiyou Mountains and Cascade and Klamath Ranges (Cheatham and Haller 1975, Hanes 1977).

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Hanes, T. L. 1971. Succession after fire in the chaparral of southern California. Ecol. Monogr. 41:27-52.

Hanes, T. L. 1976. Vegetation types of the San Gabriel Mountains. Pages 65-76 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. No. 2.

Hanes, T. L. 1977. California chaparral. Pages 417-469 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Hanes, T. L. 1982. Vegetation classification and plant community stability: a summary and synthesis. Pages 107-111 In C. E. Conrad and W. C. Oechel, tech. coords. Dynamics and management of Mediterranean-type ecosystems. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-58.

Horton, J. S. 1960. Vegetation types of the San Bernardino Mountains, California. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Tech. Pap. No. 44.

Horton, J. S., and C. J. Kraebel. 1955. Development of vegetation after fire in the chamise chaparral of southern California. Ecology 36:244-262.

Menke, J. W., and R. Villasenor. 1977. The California Mediterranean ecosystem and its management. Pages 257-270 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv., Gen. Tech. Rep. W0-3.

Minnich, R. A. 1976. Vegetation of the San Bernardino Mountains. Pages 99-124 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. No. 2.

Ornduff, R. 1974. Introduction to California plant life. Univ. Of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Pase, C. P. 1982b. Californian (coastal) chaparral. Pages 91-94 In D. E. Brown, ed. Biotic communities of the American Southwest-United States and Mexico. Desert Plants 4.

Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.

Sweeney, J. R. 1956. Responses of vegetation to fire: a study of the herbaceous vegetation following chaparral fires. Univ. Calif. Publ. Bot. 28:143-250.

Thorne, R F. 1976. The vascular plant communities of California. Pages 1-31 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. 2.

Vogl, R. J. 1976. An introduction to the plant communities of the Santa Ana and San Jacinto Mountains. Pages 77-98 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. No. 2.

Whittaker, R. H. 1975. Communities and ecosystems. 2nd ed. MacMillan Publ. Co., New York.

Zabriskie, J. G. 1979. Plants of Deep Canyon and the central Coachella Valley, California. Philip L. Boyd Deep Canyon Research Center, Univ. of California.

Zedler, P. H. 1977. Life history attributes of plants and the fire cycle: a case study in chaparral dominated by Cypressus forbesii. Pages 451-458 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv. (Washington, D.C.) Gen. Tech. Rep. W0-3.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Montane Chaparral

Roland J. Risser and Michael E. Fry

Vegetation

Structure-- The growth form of montane chaparral species can vary from treelike (up to 3 meters) to prostrate. When mature, it is often impenetrable to large mammals. Its structure is affected by site quality, history of disturbance (e.g., fire, erosion, logging) and the influence of browsing animals. For example, on shallow granitic soils in the Sierra Nevada, low dense growths of pinemat manzanita and huckleberry oak characterize an edaphic climax community, associated with scattered conifers and much exposed granite. Following fire in the mixed conifer forest habitat type, whitethorn ceanothus-dominated chaparral may persist as a subclimax community for many years. Montane chaparral is characterized by evergreen species; however, deciduous or partially deciduous species may also be present. Understory vegetation in the mature chaparral is largely absent. Conifer and oak trees may occur in sparse stands or as scattered individuals within the chaparral type.

Composition-- Montane chaparral varies markedly throughout California. Species composition changes with elevational and geographical range, soil type, and aspect. One or more of the following species usually characterize montane chaparral communities: whitethorn ceanothus, snowbrush ceanothus, greenleaf manzanita, pinemat manzanita, hoary manzanita, bitter cherry, huckleberry oak, sierra chinquapin, juneberry, fremont silktassel, Greene goldenweed, mountain mahogany, toyon, sumac and California buckthorn. As one or more of these species become dominant under various environmental regimes, further subclassification of the montane chaparral series is possible (Krebs 1972, McNaughton 1968).

Other Classifications-- Montane chaparral has been broadly described as chaparral (Munz and Keck 1973, (Küchler 1977) or mountain shrub (USDA 1977). Subclassifications based upon predominant species composition have also been described as montane mixed shrub series, huckleberry oak/pinemat manzanita series, bush chinquapin series, greenleaf manzanita series, tobacco brush series, mountain whitethorn series (Parker and Matyas 1981); upper montane chaparral, lower montane chaparral (Cheatham and Haller 1975).

Habitat Stages

Vegetation Changes-- 1;2-4:S-D. Montane chaparral in California occurs in gradations between two characteristic successional sequences: The first sequence is associated with poorer, typically shallow soils (in early stages of development), often overlying fractured bedrock. Here, chaparral species may predominate to form an edaphic climax community.

In the second sequence, chaparral is a secondary succession following disturbance on deeper forest soils. After disturbance (logging, fire, erosion) chaparral proliferates and may exclude conifers and other vegetation for many years. However, chaparral may facilitate the germination of red fir seedlings (Barbour 1984) and other shade tolerant conifers by providing a protective cover, moderating microclimate, and improving soil conditions. Chaparral shrubs may be an essential link in forest succession by building up soil nutrient levels, especially nitrogen, to the point where trees can survive (Zavitovski and Newton 1968). In mature timber stands, chaparral species may senesce due to insufficient light through the canopy and are only present as a sparse understory. Thus, silvicultural practices have a strong influence on the structure of montane chaparral.

Most montane chaparral species are fire adapted. Mature plants sprout back from the root crown. Some species require scarification of the seed for germination and may produce numerous seedlings after a fire (Gratkowski 1961). However, if fires are too frequent, these species may be eliminated (Biswell 1969) changing the subsequent structure of the community. Deer and livestock foraging on sprouting chaparral may also have a significant effect on its rate of development, structure, and ultimate species composition (Biswell and Gilman 1961, Davis 1967). The forage yields of most sprouting shrubs are reduced for the first few years after a fire, but rapidly regain their original status. Burned areas commonly produce new shrub growth high in protein and are a preferred food source for herbivores (Einarsen 1946, Swank 1956).

Duration of Stages-- Following fire, herbaceous plants may dominate for up to 5 years. Usually within 7 to 9 years the brush overstory is fully developed (Sweeney 1956, Sampson 1944). Chaparral may persist for up to 50 years or longer before conifer development begins to significantly reduce the shrub growth through shading (Lyon 1969, Sweeney 1968). Where chaparral types occur as an edaphic climax (i.e., on poor, rocky soils, fractured bedrock or lava caps), growth rates may be rather slow, growth form is usually small and stunted, and individuals may be quite old. Development of montane chaparral at high elevations is often slowed by cold temperatures, snow cover and a short growing season (Barbour and Major 1977). However, at lower elevations, burned or logged areas may sprout new growth by the next growing season.

Biological Setting

Habitat-- Montane chaparral adjoins a variety of other wildlife habitats, including montane riparian (MRI), mixed chaparral (MCH), and perennial grassland (PGS). It becomes established in disturbed coniferous habits such as ponderosa pine (PPN), mixed conifer (SMC), Jeffrey pine (JPN), red fir (RFR) and lodgepole pine (LPN). At high elevations in the southern Sierra, it may occur with a sparse juniper overstory. At the lower extent of its elevational range, montane chaparral may intergrade with mixed chaparral, a very similar habitat type.

Wildlife Considerations-- Montane chaparral provides habitat for a wide variety of wildlife. Numerous rodents inhabit chaparral (Wirtz 1974). Deer and other herbivores often make extensive use of chaparral. Throughout the west slope of the Sierra and south through the Transverse Range, deer are strongly associated with chaparral communities. Montane chaparral provides critical summer range foraging areas, escape cover and fawning habitat. In the Sierra, fawning areas are frequently found where the chaparral lies adjacent to or contains an interspersion of perennial grass or meadow-riparian habitat (Ashcraft 1975, Dasmann, 1971, Ashcraft 1976, Pacific Gas and Electric 1981). Some small herbivores use chaparral species in fall and winter when grasses are not in abundance. Rabbits and hares eat twigs, evergreen leaves and bark from chaparral. Shrubs are important to many mammals as shade during hot weather, and moderate temperature and wind velocity in the winter (Loveless 1967). Many birds find a variety of habitat needs in the montane chaparral. It provides seeds, fruits, insects, protection from predators and climate, as well as singing, roosting and nesting sites (Verner and Boss 1980), Storer and Usinger 1970).

Physical Setting

Montane chaparral can be found on shallow to deep soils, on all exposures, and from gentle to relatively steep slopes. It may dominate on more xeric sites, but occurs locally throughout the coniferous forest zone. Generally, climate is like that associated with the coniferous forest zone, cold winter temperatures with substantial precipitation. Summers are typically hot and dry (Barbour and Major 1977). In the northern portion of the state, montane chaparral is found between 914 to 2743 m (3000-9000 ft). In southern California this type occurs above 2134 m (7000 ft).

Distribution

Montane chaparral is associated with mountainous terrain from mid to high elevation at 914 to 3047 m (3000-10,000 ft). It occurs in southern California above 2134 m (7000 ft) in the Transverse Range of Los Angeles, and in San Bernardino, Riverside and San Diego counties; from Siskiyou to Kern counties in the Cascade and Sierra Nevada mountains; as a minor type from Tehama to Lake counties; and in Del Norte, Siskiyou, Trinity, and Shasta counties in the North Coast Ranges and Klamath mountains (Barbour and Major 1977). As a successional stage following disturbance, its distribution coincides with the ponderosa pine and mixed coniferous forest habitat types (Barbour and Major 1977).

Literature Cited

Ashcraft, G. C. 1975. Wildlife population response to habitat manipulation:

comparative deer use in patchcuts and virgin forest types. California Dep. Fish and Game (Sacramento), Job Prog. W-51-R-20.
Ashcraft, G., Jr. 1976. Deer propagation units and population centers. California Dep. Fish and Game Sacramento.
Barbour, M. G. 1984. Can a red fir forest be restored? Fremontia 11(4):18-19. Barbour, M. G., and J. Major eds. 1977. Terrestrial vegetation of California. John Wiley and Sons, New York.
Biswell, H. H. 1969. Prescribed burning for wildlife in California brushlands. Trans. North Amer. Wildl. and Natur. Res. Conf. 34:438-446.
Biswell, H. H., and J. H. Gilman. 1961. Brush management in relation to fire and other environmental factors on the Tehama deer winter range. Calif. Fish and Game 47:357-389.
Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript
Dasmann, W. 1971. Deer habitat management in forests. Pages 91-101 In If deer are to survive. Wildl. Manage. Inst., Washington, D.C.
Davis, J. 1967. Some effects of deer browsing on chamise sprouts after fire. Amer. Midl. Nat. 77:234-238.
Einarsen, A. S. 1946. Crude protein determination of deer food as an applied management technique. Trans. North Amer. Wildl. Conf. 11:309-312.
Gratkowski, H. 1961. Brush seedlings after controlled burning of brushlands in southwestern Oregon. J. Forestry. 59:885-888.
Krebs, C. J. 1972. Ecology: The experimental analysis of distribution and abundance. Harper and Row, New York
Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.
Loveless, C. M. 1967. Ecological characteristics of mule deer winter range. Colorado Dep. Game, Fish and Parks Tech. Publ. 20.
Lyon, L. J. 1969. Wildlife habitat research and fire in the northern Rockies. Pages 213-227 In Proc. Tall Timbers Fire Ecol. Conf.
McNaughton, S. J. 1968. Structure and function in California grasslands. Ecology 49:962-972.
Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. Univ. of California Press, Berkeley.
Pacific Gas and Electric Co. 1981. Exhibit S. Pages 18-23 In Application for amendment of application for new license, FERC Project 137, Mokelumne River. Pacific Gas and Electric Co., San Ramon, Calif.
Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.
Sampson, A. W. 1944. Plant succession on burned chaparral lands in northern California. Univ. Calif. Agr. Exp. Sta. Bull. 685.
Storer, T. l., and R. L. Usinger.1963. Sierra Nevada natural history . . . an illustrated handbook. Univ. of California Press, Berkeley.
Swank, W. G. 1956. Protein and phosphorous content of browse plants as an influence on southwestern deer herd levels. Trans. North Amer. Wildl. Conf. 21:141-158.

Sweeney, J. R. 1956. Responses of vegetation to fire: a study of the herbaceous vegetation following chaparral fires. Univ. Calif. Publ. Bot. 28:143-250.
Sweeney, J. R. 1968. Ecology of some "fire type" vegetation in northern California. Pages 111-125 In Proc. Tall Timbers Fire Ecology Conf.
U.S. Department of Agriculture 1977. Regional timber types: compartment inventory and analysis handbook. U.S. Dep. Agric., For. Serv., Pacific Southwest Region, San Francisco.
Verner, J., and A. S. Boss tech. coords. 1980. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.
Zavitovski, J., and M. Newton.1968. Ecological importance of snowbrush, Ceanothus velutinus in the Oregon Cascades. Ecology 49:1135-1145.

Montane Riparian

William E. Grenfell Jr.

Vegetation

Structure-- The vegetation of montane riparian (MRI) zones is quite variable and often structurally diverse (Marcot 1979). Usually, the montane riparian zone occurs as a narrow, often dense grove of broad-leaved, winter deciduous trees up to 30 m (98 ft) tall with a sparse understory. At high mountain elevations, MRI is usually less than 15 m (49 ft) high with more shrubs in the understory. At high elevations, MRI may not be well developed or may occur in the shrub stage only.

Composition-- In northwest California along streams west of the Klamath Mountains, black cottonwood is a dominant hardwood. In some areas, it is codominant with bigleaf maple. In either case, black cottonwood can occur in association with dogwood and boxelder. At high elevations black cottonwood occurs with quaking aspen and white alder (Parker and Matyas 1979). In northeastern California, black cottonwood, white alder and thinleaf alder dominate the montane riparian zone. Oregon ash, willow and a high diversity of forbs are common associates. In the Sierra Nevada, characteristic species include thinleaf alder, aspen, black cottonwood, dogwood, wild azalea, willow and water birch (southern Sierra east of the crest), white alder and dogwood (north Sierra). In the southern Coast Range as well as Transverse and Peninsular ranges, bigleaf maple and California bay are typical dominants of montane riparian habitat. Fremont cottonwood is the most important cottonwood in the Sierra below 1524 m (5000 ft), much of the Coast Ranges and the Transverse and Peninsular ranges.

MRI habitats can occur as alder or willow stringers along streams of seeps. In other situations an overstory of Fremont cottonwood, black cottonwood and/or white alder may be present.

Other Classifications-- Montane riparian habitats are also described as riparian (Laudenslayer 1982), riparian deciduous (Verner and Boss 1980, Marcot 1979), bigleaf maple, alder, maple-alder-dogwood, white alder, willow and alder-willow series (Parker and Matyas 1979), mixed riparian woodland -6.21, willow thickets - 6.24 and red alder groves - 6.22 (Cheatham and Haller 1975)
.

Habitat Stages

Vegetation Changes-- 1;2-5:S-D;6. Definite successional stages are not described in the literature. Many montane riparian stages may prevail indefinitely, climax or subclimax. Shrub-type stages should be evaluated as size/age class 1 or 2. Overstory trees such as cottonwood, maple and alder may range up to size/age class 6.

Duration of Stages-- Montane riparian habitats within given watersheds tend to maintain the same mosaic of stages. However, the location of these stages may vary as a result of periodic torrential flows. Riparian Systems can be damaged by debris, sedimentation, or uprooting of entire plants which are redeposited further downstream (Campbell and Green 1968).

Biological Setting

Habitat-- The transition between MRI and adjacent non-riparian vegetation is often abrupt, especially where the topography is steep. This habitat intergrades with montane chaparral, montane hardwood, montane hardwood/conifer, lodgepole pine, red fir and wet meadow habitats.

Wildlife Considerations-- All riparian habitats have an exceptionally high value for many wildlife species (Thomas 1979, Marcot 1979, Sands 1977). Such areas provide water, thermal cover, migration corridors and diverse nesting and feeding opportunities. The shape of many riparian zones, particularly the linear nature of streams, maximizes the development of edge which is so highly productive for wildlife (Thomas 1979).

The range of wildlife that uses the MRI habitat for food, cover and reproduction include amphibians, reptiles, birds and mammals. The southern rubber boa and Sierra Nevada red fox are among the rare, threatened or endangered wildlife that use MRI habitats during their life cycles.

Physical Setting

Riparian areas are found associated with montane lakes, ponds, seeps, bogs and meadows as well as rivers, streams and springs. Water may be permanent or ephemeral (Marcot 1979). The growing season extends from spring until late fall, becoming shorter at higher elevations. Most tree species flower in early spring before leafing out.

Distribution

Montane riparian habitats are found in the Klamath, Coast and Cascade ranges and in the Sierra Nevada south to about Kern and northern Santa Barbara Counties, usually below 2440 m (8000 ft). The Peninsular and transverse ranges of southern California from about southern Santa Barbara to San Diego Counties also include MRI habitat. MRI subtype, consisting mostly of red alder, is found from northern San Luis Obispo to Del Norte Counties along the immediate coast (Cheatham and Haller 1975).

Literature Cited

Campbell, C. J., and W. Green.1968. Perpetual succession of stream-channel vegetation in a semi-arid region. J. Ariz. Acad. Sci. 5(2):86-98.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Laudenslayer, Jr., W. F. (ed.) 1982. Introduction and species-habitat relationships matrix. Vol 1. California wildlife/habitat relationships program: northeast interior zone. U.S. Dep. Agric., For. Serv., Pacific Southwest Region, San Francisco.

Marcot, B. G., ed. 1979. Introduction Vol. I. California wildlife/habitat relationships program north coast/ cascades zone. U.S. Dep. Agric., For. Serv., Six Rivers Nat'l. Forest, Eureka, Calif.

Parker, I., and W. J. Matyas. 1979. CALVEG: A classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group. San Francisco.

Sands, A., ed. 1977. Riparian forests in California, their ecology and conservation. Univ. of California, Davis, Inst. Of Ecol. Publ. No. 15.

Thomas, J. W., tech ed. 1979. Wildlife habitats in managed forests in the Blue Mountains of Oregon and Washington. U.S. Dept. of Agric., For. Serv. Handbook No. 553.

Verner, J., and A. S. Boss tech. coords. 1980. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.

Valley Foothill Riparian

William E. Grenfell Jr.

Vegetation

Structure-- Canopy height is approximately 30 m (98 ft) in a mature riparian forest, with a canopy cover of 20 to 80 percent. Most trees are winter deciduous. There is a subcanopy tree layer and an understory shrub layer. Lianas (usually wild grape) frequently provide 30 to 50 percent of the ground cover and festoon trees to heights of 20 to 30 m (65 to 98 ft). Herbaceous vegetation constitutes about one percent of the cover, except in openings where tall forbs and shade-tolerant grasses occur (Conard et al. 1977). Generally, the understory is impenetrable and includes fallen limbs and other debris.

Composition-- Dominant species in the canopy layer are cottonwood, California sycamore and valley oak. Subcanopy trees are white alder, boxelder and Oregon ash. Typical understory shrub layer plants include wild grape, wild rose, California blackberry, blue elderberry, poison oak, buttonbrush, and willows. The herbaceous layer consists of sedges, rushes, grasses, miner's lettuce, Douglas sagewort, poison-hemlock, and hoary nettle.

Other Classifications-- Other classification schemes that describe VRI habitats are Cottonwood and California Sycamore (Parker and Matyas 1981), Central Valley Bottomland Woodland 6.11, Southern Alluvial Woodland - 6.31 (Cheatham and Haller 1975), Wild Rose Alder, Cottonwood, Sycamore, Willow (Paysen et al. 1980), Riparian Forest - 28 (Küchler 1977) and Forested Wetland -61 (Anderson et al. 1976).

Habitat Stages

Vegetation Changes-- 1;2-5:S-D. Cottonwoods grow rapidly and can reach WHR size/age class 5 in about 20 to 25 years. One specimen measuring 92 cm (36 in) (inside the bark) showed an age of 29 years (Sudworth 1908). This secondary succession to climax could occur as rapidly as 25 to 30 years in VRI habitats dominated by cottonwood. One valley oak tree 54 cm (21 in) in diameter (WHR size/age class 4) showed an age of 57 years. Valley oak dominated riparian systems would probably take 75+ years to reach climax/maturity. Some VRI types consisting of only a shrub layer (VRI 1;2: S-D) (willows, wild rose, blackberry) may persist indefinitely.

Duration of Stages-- Shrubby riparian willow thickets may last 15-20 years before being overtopped and shaded out by cottonwoods. Cottonwood or willow tree habitats close to river channels that receive a good silt infusion, without major disruptive flows, tend to be self perpetuating (R. Holland pers. comm.).

Biological Setting

Habitat-- Transition to adjacent non-riparian vegetation is usually abrupt, especially near agriculture (Cheatham and Haller 1975). The Valley-Foothill Riparian habitat is found in association with Riverine (RIV), Grassland (AGS, PGS), Oak Woodland (VFH) and Agriculture (PAS, CRP). It may intergrade upstream with Montane Riparian.

Wildlife Considerations-- Valley-foothill riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles occur in lowland riparian systems. Many are permanent residents, others are transient or temporal visitors (Brode and Bury 1985). In one study conducted on the Sacramento River, 147 bird species were recorded as nesters or winter visitants (Laymon 1985). Additionally, 55 species of mammals are known to use California's Central Valley riparian communities (Trapp et al. 1985).(No 1985 cites for Brode and Bury, Laymon, and Trapp et al. in habitat Lit Cite. I used 1984 cites for all 3 in Lit Cite at end.)

Physical Setting

Valley-foothill riparian habitats are found in valleys bordered by sloping alluvial fans, slightly dissected terraces, lower foothills, and coastal plains. They are generally associated with low velocity flows, flood plains, and gentle topography. Valleys provide deep alluvial soils and a high water table. The substrate is coarse, gravelly or rocky soils more or less permanently moist, but probably well aerated (Cheatham and Haller 1975). Average precipitation ranges from 15 to 76 cm (6-30 in), with little or no snow. The growing season is 7 to 11 months. Frost and short periods of freezing occur in winter (200 to 350 frost-free days). Mean summer maximum temperatures are 24 to 39 C (75 to 102 F), mean winter minima are 2 to 7 C (29 to 44 F) (Munz and Keck 1973). VRI habitats are characterized by hot, dry summers, mild and wet winters. Coastal areas have a more moderate climate than the interior and receive some summer moisture from fog (Bailey 1980). Potential evaporation during the warmest months is often greater than precipitation. Low rainfall and streamflow result in water scarcity in many parts of the area.

Distribution

Valley-foothill riparian habitats occur in the Central Valley and the lower foothills of the Cascade, Sierra Nevada and Coast ranges. They are also found in lower slopes at the bases of the Peninsular and Transverse ranges. A few lower elevation locations are on the desert side of the southern California mountains. VRI habitats range from sea level to 1000 m (3000 ft), fingering upward to 1550 m (5000 ft) on south-facing slopes.

Literature Cited

Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Dep. Interior, Geol. Surv., Prof. Pap. 964.

Bailey, R. 1980. Descriptions of ecoregions of the United States. U.S. Dep. Agric., For. Serv., Misc. Publ. 1391.

Brode, J., and R. B. Bury.1984. The importance of riparian systems to amphibians and reptiles. Pages 30-36 in R. E. Warner and K. Hendrix, eds. California riparian systems: ecology, conservation, and productive management Univ. of California Press, Berkeley.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Conard, S., R. McDonald, and R. Holland. 1977. Riparian vegetation and flora of the Sacramento Valley. Pages 47-55 In A. Sands, ed. Riparian forests in California: their ecology and conservation. Univ. of California, Davis, Inst. of Ecol. Publ. No. 15.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Laymon, S. A.1984. Riparian bird community structure and dynamics: Dog Island, Red Bluff, California, Pages 587-597 In R. E. Warner and K. M. Hendrix, California riparian systems: ecology, conservation and productive management. Univ. of California Press, Berkeley.

Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. Univ. of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.

Sudworth, G. B. 1908. Forest trees of the Pacific slope. U.S. Govt. Printing Office.

Trapp, G. R., G. L., Linck, and E. D. Whisler. 1984. The status of ecological research on the mammal fauna of California's central valley riparian communities. Pages 942-949 In R. E. Warner and K. Hendrix, eds. California riparian systems: ecology, conservation, and productive management. Univ. of California Press, Berkeley.

Coastal Scrub

Sally de Becker

Vegetation

Structure-- Structure of the plant associations that comprise Coastal Scrub is typified by low to moderate-sized shrubs with mesophytic leaves, flexible branches, semi-woody stems growing from a woody base, and a shallow root system (Harrison et al. 1971, Bakker 1972). Structure differs among stands, mostly along a gradient that parallels the Pacific coastline. Northern Coastal Scrub, from Humboldt County to the San Francisco Bay Area, ranges from a patchy oceanside cover of nearly prostrate subshrubs surrounded by grassland to a dense and continuous cover of two layers: an overstory of shrubs up to 2 m (7 ft) tall and a perennial herb/subshrub understory up to 0.3 m (1 ft) tall. The southern sage scrub form, typical of inland central (around Mt. Diablo) and most southern stands, is made up of a shrub layer up to 2.0 m (7 ft) tall. Canopy cover usually approaches 100 percent in these stands (Mooney 1977), although bare areas are sometimes present. Sufficient light penetrates through the canopy to support an herbaceous understory. Bare zones about 1 m (3 ft) wide may extend from stands dominated by sage species into surrounding annual grasslands (Halligan 1973, Mooney 1977, Westman 1981 a) .

Composition-- No single species is typical of all Coastal Scrub stands. As with structure, composition changes most markedly with progressively more xeric conditions from north to south along the coast. With the change from mesic to xeric sites, dominance appears to shift from evergreen species in the north to drought-deciduous species in the south. Variation in coastal influence at a given latitude produces less pronounced composition changes. Two types of northern Coastal Scrub are usually recognized. The first type (limited in range) occurs as low-growing patches of bush lupine and many-colored lupine at exposed, oceanside sites. The second and more common type of northern Coastal Scrub usually occurs at less exposed sites. Here coyotebush dominates the overstory. Other common overstory species are blue blossom ceanothus, coffeeberry, salal, bush monkeyflower, blackberry, poison-oak and wooly sunflower. Bracken fern and swordfern are dominant in the understory; common cowparsnip, Indian paintbrush, yerba buena and California oatgrass are typically present (Heady et al. 1977). Around Half Moon Bay, western hazelnut, Pacific bayberry, and sagebrush are also present (Mayfield and Shadle 1983).

Southern sage scrub, occurring intermittently over a larger area than the two northern Coastal Scrub types, is subdivided into three main types. Differences in composition of these three types correspond mostly to available moisture. A fairly common species in all three types is California sagebrush. The most mesic area, from Mt. Diablo south to Santa Barbara, is dominated by black sage and California buckwheat. In the less mesic region from Santa Barbara south to Orange County, purple sage and California buckwheat join black sage in importance. Golden yarrow, isocoma, rolled leaf monkeyflower, and California encelia are typical. Chaparral yucca is found on the slightly drier sites within the region, especially in Ventura County (Kirkpatrick and Hutchinson 1977, Mooney 1977, Westman 1981b, Gray 1982). The southernmost stands are the most xeric of the form. Composition here is characterized by succulent species and a distinct Baja California influence. In addition to the California sagebrush, California buckwheat, and wooly sunflower typical of the stands farther north, California adolphia, coastal agave, and cunyado are present south of San Diego (Mooney 1977, Westman 1981a).

Other Classifications-- The following vegetation types and plant communities defined in the literature fall into WHR's Coastal Scrub habitat: Coyote Brush, Lupine, Salal, Sumac, Ragweed, California Sagebrush, Encelia, Buckwheat and Sage described by Parker and Matyas (1981); the Opuntia series of succulent shrub subformation and the Coastal Sagebrush, Encelia, Baccharis, Salvia, Lupine, and California Buckwheat series of the soft chaparral subformation described by Paysen et al. (1980); Coastal Strand, Northern Coastal Scrub, Coastal Sage Scrub, and Coastal Sagebrush described by Munz and Keck (1973); Coastal Sagebrush, Northern Seashore Communities (Northern Dune Scrub), Southern Seashore Communities (Central Dune Scrub, Southern Dune Scrub), and Coastal Prairie - Scrub Mosaic described by Küchler (1977); and the Northern Coastal Dune Scrub subdivision of Partially Stabilized and Stabilized Coastal Dunes, Coastal Bluff Scrub, Coastal Scrub, and Maritime Cactus Scrub described by Cheatham and Haller (1975).

Habitat Stages

Vegetation Changes-- 1;24:S-D Only tentative conclusions can be drawn from the relatively few studies of vegetation change in Coastal Scrub. Stands in some areas are considered seral stages. But most phases of Coastal Scrub probably change little in composition after the first 10 years following fire or if subjected only to natural, moderate disturbance. In contrast, major or human-caused disturbances often permit Coastal Scrub to invade new areas, or permit invasion by other habitats.

The lupine phase of northern Coastal Scrub appears to be replaced by grasslands under grazing pressure, returning if grazing is halted; when undisturbed, the lupine phase appears to persist in a dynamic equilibrium, patches dying out while new ones become established (Davidson and Barbour 1977). The coyotebush stands in the north have been considered a seral stage in a progression from grassland to forest, though evidence is inconclusive. Elliott and Wehausen (1974) found no significant increase of scrub in a Pt. Reyes coastal prairie grassland/northern Coastal Scrub mosaic when cattle were excluded for six years. Coyotebush was replaced by forest in the Berkeley Hills (by mixed evergreen forest, coast live oak forest and California bay forest) (McBride and Heady 1968, McBride 1974), but this replacement pattern was not observed on the nearby Pt.

Reyes Peninsula (Grams et al. 1977).

Southern Coastal Scrub on some sites is replaced by chaparral types (Mooney 1977, Gray 1983) but the usual trend of vegetation change in undisturbed or naturally disturbed stands is towards shrubs of various ages and size classes. Composition remains constant because recruitment is continual. Seeds germinate and young plants survive and grow under the canopy of mature plants. Southern Coastal Scrub is fire-adapted and most species sprout readily from crowns after burning. Thus, fire temporarily creates an even-aged stand, but reproduction by seed occurs within the second year after fire (Westman 1982).

Disturbances such as road cuts or landslides create areas often invaded by both northern and southern Coastal Scrub. Light, wind-dispersed seed and tolerance of xeric conditions allow Coastal Scrub to establish itself in disturbed areas (Harrison et al. 1971, Malanson and O'Leary 1982). Disturbance caused by oxidants in air pollution may have caused reduced cover by native Coastal Scrub species at certain sites in southern California (Westman 1979).

Duration of Stages-- As discussed, most Coastal Scrub types can probably exist indefinitely and will not change greatly in the absence of disturbance, or when affected only by natural perturbations. Bradbury (1978) observed southern sage scrub surrounded by chaparral types that endured for over 45 years; Westman (1981a) observed healthy stands that had not burned in over 60 years. McBride (1974) estimates that invasion by chamise, chaparral, forest or woodland types would take 50 years.

Biological Setting

Habitat-- At its lowest elevations, Coastal Scrub is associated with Coastal Dunes, Coastal Prairie/Perennial Grassland (PGS), Cropland (CRP) and Pasture (PAS). At its central and highest elevations, it is associated with annual grassland (AGS), Douglas fir-Hardwood (DFR), Coastal Oak Woodland (COW), Montane Hardwood (MHW), Closed-Cone Pine Cypress (CPC), Chamise-Redshank Chaparral (CRC) and Mixed Chaparral (MCH).

Wildlife Considerations-- Little is known about the importance of Coastal Scrub habitat to wildlife. Though vegetation productivity is lower in Coastal Scrub than in adjacent chaparral habitats associated with it (Gray 1982), Coastal Scrub appears to support numbers of vertebrate species roughlyequivalent to those in surrounding habitats (Stebbins 1978). The Federal and State listed endangered peregrine falcon, Morro Bay kangaroo rat and the Santa Cruz long-toed salamander all occur in Coastal Scrub (Jones & Stokes 1981), though not exclusively. A subspecies of the black-tailed gnatcatcher, a California Department of Fish and Game Species of Special Concern (Remsen 1978), is found exclusively in southern sage scrub.

Physical Setting

Coastal Scrub seems to tolerate drier conditions than its associated habitats. It is typical of areas with steep, south-facing slopes; sandy, mudstone or shale soils; and average annual rainfall of less than 30 cm (12 in). However, it also regularly occurs on stabilized dunes, flat terraces, and moderate slopes of all aspects where average annual rainfall is up to 60 cm (24 in). Stand composition and structure differ markedly in response to these physiographic features (Harrison et al. 1971, Bakker 1972, Mooney 1977, Cole 1980, Kirkpatrick and Hutchinson 1980, Parker and Matyas 1981, Westman 1981b).

Distribution

Coastal Scrub occurs discontinuously in a narrow strip throughout the length of California. Latitude ranges from about 32~ to 42 N and longitude ranges between 117 and 124 . Coastal Scrub usually occurs within about 45 km (20 mi) of the ocean; in Riverside County, it extends at least 110 km (50 mi) inland (see map). Elevation ranges from sea level to about 900 m (3000 ft).

Literature Cited

Bakker, E. 1972. An island called California. Univ. of California Press, Berkeley.

Bradbury, D. E. 1978. The evolution and persistence of a local sage/chamise community pattern in southern California. Assoc. of Pacific Coast Geographers Yearbook 40:39-56.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Cole, K. 1980. Geological control of vegetation in the Purisima Hills, California. Madroño 27:79-89.

Davidson, E. D., and M. G. Barbour. 1977. Germination, establishment and demography of coastal bush lupine Lupinus arboreus at Bodega Head, California, USA. Ecology 58:592-600.

Elliott, H. W., III, and J. D. Wehausen. 1974. Vegetational succession on coastal rangeland of Point Reyes Peninsula. Madroño 22:231-238.

Grams, H. J., K. R. McPherson, V. V. King, S. A. MacLeod, and M. G. Barbour. 1977. Northern coastal scrub on Point Reyes Peninsula, California. Madroño 24:18-24.

Gray, J. T. 1982. Community structure and productivity in Ceanothus chaparral and coastal sage scrub of southern California. Ecol. Monogr. 52:415-435.

Gray, J. T. 1983. Competition for light and a dynamic boundary between chaparral and coastal sage scrub. Madroño 30:43-49.

Halligan, J. P. 1973. Bare areas associated with shrub stands in grassland: the case of Artemisia californica. BioScience 23:429-432.

Harrison, A., E. Small, and H. Mooney. 1971. Drought relationships and distribution of two Mediterranean climate Californian plant communities. Ecology 52:869-875.

Heady, H. F., T. C. Foin, M. M. Hektner, D. W. Taylor, M. G. Barbour, and W. J. Barry. 1977. Coastal prairie and northern coastal scrub. Pages 733-760 In M. G. Barbour

and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.
Kirkpatrick, J. B., and C. F. Hutchinson. 1980. The environmental relationships of Californian coastal sage scrub and some of its component communities and species. J. Biogeography 7:23-38.
Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.
Malanson, G. P., and J. F. O'Leary. 1982. Post fire regeneration strategies of Californian USA coastal sage shrubs. Oecologia 53:355-358.
McBride, J. 1974. Plant succession in the Berkeley Hills, California. Madroño 22:317-329.
McBride, J., and H. F. Heady.1968. Invasion of grasslands by Baccharis piluaris DC. J. Range Manage. 21:106-108.
Mayfield, D. W., and S. M. Shadle. 1983. Natural environmental study for a proposed bypass of Devils Slide on Route 1 in San Mateo County. CalTrans Dist 04, Envir. Planning Branch Rep.
Mooney, H. A. 1977. Southern coastal scrub. Pages 471-489 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.
Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. Univ. of California Press, Berkeley.
Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.
Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.
Remsen, J. V. 1978. Bird species of special concern in California. Calif. Dep. Fish and Game, Wildl. Manage. Br. (Sacramento, Calif.), Adm. Rep. 78-1.
Stebbins, R. 1978. Appendix I: Use of habitats in the East Bay Regional Parks by free living vertebrate animals. In J. Nicole, ed. Vegetation management principles and policies for the East Bay Regional Park District East Bay Reg. Park Dist., Oakland, Calif.
Westman, W. E. 1979. Oxidant effects on California coastal sage scrub. Science 205:1001-1003.
Westman, W. E. 1981a. Diversity relations and succession in California coastal sage scrub. Ecology 62:170-184.
Westman, W. E. 1981b. Factors influencing the distribution of species of California coastal sage scrub. Ecology 62:439-455.
Westman, W. E. 1982. Coastal sage scrub succession. Pages 91-99 In C. E. Conrad and W. C. Oechel, tech. coords. Proceedings of the symposium on dynamics and management of Mediterranean-type ecosystems. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-58.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Blue Oak-Foothill Pine

Jared Verner

Vegetation

Structure-- This habitat is typically diverse in structure both vertically and horizontally, with a mix of hardwoods, conifers, and shrubs. The shrub component is typically composed of several species that tend to be clumped, with interspersed patches of Annual Grassland. Woodlands of this type generally have small accumulations of dead and downed woody material and relatively few snags, compared with other tree habitats in California. Most existing stands of this type are in mature stages, with canopy cover ranging from 10 to 59 percent, and dbh ranging from 2.5 to 30 cm (1 to 12 in). Size class 6 depends on a sparse overstory of foothill pine above a lower canopy of oaks, as canopies of blue oak seldom exceed 15 m (50 ft) in height. Individual trees seldom exceed 125 cm (49 in) dbh, and exceptionally may reach 30 m (100 ft) in height.

Composition-- Blue oak and foothill pine typically comprise the overstory of this habitat, with blue oak usually most abundant. Stands dominated by foothill pine tend to lose their blue oak, which is intolerant of shade (P. M. McDonald, pers. comm.). In the foothills of the Sierra Nevada, tree species typically associated with this habitat are interior live oak and California buckeye. In the Coast Range, associated species are the coast live oak, valley oak, and California buckeye (Griffin 1977). Interior live oak sometimes dominates the overstory, especially in rocky areas and on north-facing slopes at higher elevations (Neal 1980).

At lower elevations, where blue oaks make up most of the canopy, the understory tends to be primarily annual grasses and forbs. At higher elevations where foothill pines and even interior live oaks sometimes comprise the canopy, the understory usually includes patches of shrubs in addition to the annual grasses and forbs. Shrub species include Ceanothus spp. Mariposa manzanita, whiteleaf manzanita, Parry manzanita redberry, California coffeeberry, poison-oak, silver lupine, blue elder, California yerba-santa, rock gooseberry, and California redbud.

Other Classifications-- This type is referred to as Blue Oak-Foothill Pine by the Society of American Foresters (Eyre 1980) and Parker and Matyas (1981), and as Blue Oak-Foothill Pine Forest by Küchler (1977). Neal (1980) gives an excellent, short description of the type, and a more complete description can be gleaned from Griffin (1977) in his discussion of California's oak woodlands.

Habitat Stages

Vegetation Changes-- 2-5:S-D;6. Succession presumably proceeds from annual grasslands directly to tree stages at lower elevations, where a shrub layer is usually sparse or absent. At higher elevations, shrubs and trees regenerate together.

Duration of Stages-- Secondary succession beginning with disturbed soil is rapid during early stages, with annual grasslands giving way to shrubs within 2 to 5 years. However, stands of mature shrubs adequate to provide habitat for those wildlife species requiring them take longer to develop approximately 10 to 15 years. The conifers grow more rapidly than the hardwoods, maturing into relatively large trees even within 30 to 40 years, judging from the photo series taken at the San Joaquin Experimental Range in Madera County (Woolfolk and Reppert 1963). Most of the meager information on growth rates of blue oaks comes from sites in northern and central California. They generally grow slowly at all ages. Blue oaks in Nevada, Shasta, and Placer Counties showed little or no growth in height after they reached 65 cm (26 in) dbh (McDonald 1985)(No McDonald 1985 in Habitat Lit Cite.). The age at which they normally begin producing acorn crops is unknown (M. McClaran, pers. comm.), but it likely takes several decades. Concern has been expressed for the long-term existence of this habitat (Holland 1976), because "little regeneration has occurred since the late 1800s, as livestock, deer, birds, insects, and rodents consume nearly the entire acorn crop each year. Of the few seedlings that become established a large proportion are eaten by deer" (Neal 1980:126). Furthermore, the absence of grazing livestock does not generally result in regeneration (White 1966), because many other animals eat acorns and seedling oaks. Moreover, introduced grasses are subject to burning, may compete directly with seedling oaks for light and nutrients, and may be allelopathic to the oaks. The general absence of secondary successional stages of these woodlands has precluded detailed study of their composition or rates of change.

Biological Setting

Habitat-- As Griffin (1977:386) points out, "oak woodland seldom forms a continuous cover over large areas. It is a major item in a mosaic including valley grassland...and chaparral...with strips of riparian forest." This mosaic is reflected in the character of the understory in stands of BOP woodlands. At lower elevations, these woodlands merge with Annual Grasslands, Blue Oak Woodlands, and Valley Oak Woodlands. The Annual Grasslands actually extend into the woodlands as a ground cover where not shaded by shrubs. The Blue Oak Woodlands differ from the BOP type in lacking a conifer component and usually in lacking a shrub component.

At upper elevations, BOP habitats merge with extensive stands of Mixed Chaparral in most localities, although in some places the Ponderosa Pine type grows at an elevation low enough to form a mixed ecotone with Mixed Chaparral and BOP.

Wildlife Considerations-- BOP woodlands provide breeding habitats for a large variety of wildlife species, although no species is totally dependent on them for breeding, feeding, or cover. In the western Sierra Nevada, for example, 29 species of amphibians and reptiles, 79 species of birds, and 22 species of mammals find mature stages of this type suitable or optimum for breeding, assuming that other special habitat requirements are met (Verner and Boss 1980).

Most species breed during late winter and early spring a factor to consider when planning management activities. Snags are less common, and hence less critical to wildlife, in this than in other forest types. Most species of cavity-nesting birds, for example, use living oaks. The cavities are often in scars where limbs have broken from the trunk or a main branch and have developed a level of decay that makes them more easily excavated by primary cavity nesters.

According to Olson (1974), blue oaks produce an abundant seed crop every 2 to 3 years and bumper crops every 5 to 8 years; however, McClaran (pers. comm.) questions that such a clear cycle of acorn production has been confirmed. In any case, acorns are an important food resource for many species of birds (Verner 1980a.) and mammals (Barrett 1980).

Physical Setting

The habitat occurs in a typically Mediterranean climate hot, dry summers and cool, wet winters. Most precipitation falls as rain from November through April, averaging from 51 to 102 cm (20 to 40 in) within the primary range of blue oak (McDonald 1985). The frost-free growing season ranges from 150 to 300 days, with January minima averaging 1 C (30 F) and July maxima averaging 32 C (90 F) (McDonald 1985). Soils are from a variety of generally well-drained parent materials, ranging from gravelly loam through stony clay loam. Soils rich in rock fragments are typical (McDonald 1985).

Distribution

The range of this habitat (well described by Neal, 1980) generally rings the foothills of the Central Valley, between 150 and 915 m (500 and 3000 ft) in elevation. The Pit River drainage in the Cascade Range and the foothills of the Klamath Mountains mark the approximate northern limit. The habitat is nearly continuous in the western foothills of the Sierra Nevada, except for a gap of 96 km (60 mi) between the Kings and Kern Rivers, where foothill pine is missing. The distribution extends south into the Liebre Mountains of northern Los Angeles County and the drainages of Piru Creek and Santa Clara River in Ventura County. It is discontinuous in the Coast Range west of the Central Valley from Ventura to Mendocino Counties. And it extends westward to within 16 km (10 mi) of the coast in a few places (Griffin 1977, Neal 1980).

Literature Cited

Barrett, R. H. 1980. Mammals of California oak habitats: management implications. Pages 275-291 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Eyre, F. H., ed. 1980. Forest cover types of the Unites States and Canada. Soc. Amer. Foresters, Washington D.C.

Griffin, J. R. 1977. Oak woodland. Pages 383-415 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Holland, V. L. 1976. In defense of blue oaks. Fremontia 4:3-8.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Neal, D. L. 1980. Blue oak-foothill pine. Pages 126-127 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.

Olson, D. F., Jr. 1974. Quercus L. oak. Pages 692-703 In Seeds of woody plants in the United States. U.S. Dep. Agric. Handbook No. 450.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Verner, J. 1980a. Birds of California oak habitats: management implications. Pages 246-264 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.) Gen. Tech. Rep. PSW-44.

Verner, J., and A. S. Boss tech. coords. 1980. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.

Woolfolk, E. J., and J. N. Reppert. 1963. Then and now: changes in California annual type range vegetation. U.S. Dep. Agric., For. Serv. (Berkeley,Calif.), Res. Note. PSW- N24.

Blue Oak Woodland

Lyman V. Ritter

Vegetation

Structure-- Generally these woodlands have an overstory of scattered trees, although the canopy can be nearly closed on better quality sites (Pillsbury and De Lasaux 1983). The density of blue oaks on slopes with shallow soils is directly related to water stress (Griffin 1973). The canopy is dominated by broad-leaved trees 5 to 15 m (16 to 50 ft) tall, commonly forming open savanna-like stands on dry ridges and gentle slopes. Blue oaks may reach 25 m (82 ft) in height (McDonald 1985); the tallest tree, found in Alameda County, measured 28.7 m (94 ft) high and had a crown spread of 14.6 m (48 ft) (Pardo 1978). Shrubs are often present but rarely extensive, often occurring on rock outcrops. Typical understory is composed of an extension of Annual Grassland vegetation.

Composition-- Blue oak is the dominant species, comprising 85 to 100 percent of the trees present. Common associates in the canopy are coast live oak in the Coast Range, interior live oak in the Sierra Nevada, valley oak where deep soil has formed, and western juniper in the Cascade Range. In the Tehachapi and Paiute Ranges in Kern County, this habitat mixes with species from east of the mountains California juniper and single-leaf pinyon. In interior sections of the southern Coast Range, as in San Luis Obispo County, it mixes with California juniper (V. L. Holland, pers. comm.). Associated shrub species include poison-oak, California coffeeberry, buckbrush, redberry, California buckeye, and manzanita spp. The ground cover is comprised mainly of annuals, such as brome grass, wild oats, foxtail, needlegrass, filaree, fiddeneck, and others. Comprehensive descriptions of different BOW's can be found in White (1966), Griffin (1977), Baker et al. (1981), and Pillsbury and De Lasaux (1983).

Other Classifications-- The habitat is referred to as Foothill Woodland by Munz and Keck (1959), Blue Oak Phase of the Foothill Woodlands by Griffin (1977), Blue Oak Series by Paysen et al. (1980), Blue Oak Savanna by Verner and Boss (1980), and Blue Oak Community by Parker and Matyas (1981). BOW's and Blue Oak-Foothill Pine Woodlands are considered a single habitat in Küchler's (1977) Blue Oak-Foothill Pine Forest (25) and in the Blue Oak-Foothill Pine (250) type of the Society of American Foresters (Eyre 1980).

Habitat Stages

Vegetation Changes-- 1;2-5:S-D. Details of successional trends in this habitat type are poorly known. Succession presumably proceeds directly from annual grasslands to tree stages. Most stands of BOW exist as medium or large tree stages with few or no young blue oaks present (White 1966, Holland 1976, Griffin 1977, Baker et al. 1981). Therefore, only structural classes 3-5:S-D are likely to be found. Few areas can be found in California where successful recruitment of blue oaks has occurred since the turn of the century (Holland 1976). This may be due to changes in land use; increased consumption or damage of acorns and seedlings by insects, livestock, and native animals; competition between seedlings and introduced annuals for available soil nutrients and moisture; and the absence of appropriate climatic conditions. Where germination of acorns occurs, survival and growth of the seedlings typically fail. Probably in the drier savanna-like stands, the grassland openings will simply become larger as older trees die. Griffin (1977) suggests that live oaks may replace deciduous oaks in some areas, because their seedlings are more browse resistant. Many authorities question whether conditions will ever again support the recruitment of blue oaks needed to maintain these important woodlands.

Duration of Stages-- Valid generalizations about the duration of various successional stages leading to mature stands of BOW are not possible, because adequate quantitative studies have never been done. The successional sequence probably takes at least 50 years, even on good sites. Age studies in the Coast Range (White 1966, Pillsbury and De Lasaux 1983) and the southern Sierra Nevada (Brooks 1969) indicate that most blue oak stands are currently 80 to 120 years in age. Blue oaks are relatively slow-growing, long-lived trees. Large blue oaks range in age from 153 to 390 years (White 1966). Estimation of tree age based on dbh measurements is risky, however, because the dbh relationship varies tremendously depending on site quality. Moreover, height growth is extremely slow or even ceases after trees reach 65 cm (26 in) in dbh (McDonald 1985).

Biological Setting

Habitat-- This type usually intergrades with Annual Grasslands or Valley Oak Woodlands at lower elevations and Blue Oak-Foothill Pine woodlands at higher elevations.

Wildlife Considerations-- The importance of oak habitats to wildlife in California has recently been reviewed by Barrett (1980) and Verner (1980a.), but they give few details relevant specifically to BOW's. Verner and Boss (1980) give data on wildlife use in blue oak savannahs of the western Sierra Nevada. They indicate that 29 species of amphibians and reptiles, 57 species of birds, and 10 species of mammals find mature stages of this type suitable or optimum for breeding, assuming that other special habitat requirements are met. Griffin (1971) concluded that acorns buried by scrub jays, yellow-billed magpies, western gray squirrels and California ground squirrels are more likely to germinate because they root better and are less likely to be eaten. Although many wildlife species benefit from the use of oaks and even enhance oak germination, additional information is needed on many aspects of oak-wildlife relationships before this habitat can be properly managed.

Physical Setting

BOW's are usually associated with shallow, rocky, infertile, well-drained soils from a variety of parent materials (McDonald 1985). Blue oaks are well adapted to dry, hilly terrain where the water table is usually unavailable (Griffin 1973). The climate is Mediterranean, with mild wet winters and hot dry summers. Climatic extremes are relatively great in these woodlands, because they have a considerable geographic and elevational range. Average annual precipitation varies from 51 to 102 cm (20 to 40 in) over most of the blue oak's range, although extremes are noted from 25 cm (10 in) in Kern County to 152 cm (60 in) in Shasta County (McDonald 1985). Blue oaks have an unusual tolerance of severe drought, even shedding their leaves during periods of extreme moisture stress. This survival trait contributes to its pattern of distribution, as it competes most successfully with other tree species on drier sites (McDonald 1985). Mean maximum temperatures are from 24 to 36 C (75 to 96 F) in summer, and minima are from 2 to 6 C (29 to 42 F) in winter. The growing season ranges from 6 months in the north to the entire year in the south, with 175 to 365 frost-free days (Burcham 1975).

Distribution

BOW's occur along the western foothills of the Sierra Nevada-Cascade Ranges, the Tehachapi Mountains, and in the eastern foothills of the Coast Range, forming a nearly continuous ring around the Central Valley. The habitat is discontinuous in the valleys and on lower slopes of the interior and western foothills of the Coast Range from Mendocino County to Ventura County. It is generally found at elevations from 152 to 610 m (500 to 2000 ft) at the northern end of its range and on the western slopes of the Sierra Nevada, from 76 to 915 m (250 to 3000 ft) in the central Coast Range, and from 168 to 1370 m (550 to 4500 ft) in the Transverse and Peninsular Ranges (Sudworth 1908).

Literature Cited

Baker, G. A., P. W. Rundel, and D. J. Parsons 1981. Ecological relationships of Quercus Douglasii. (Fagaceae) in the foothill zone of Sequoia National Park, California. Madroño 28:1-12.

Barrett, R. H. 1980. Mammals of California oak habitats: management implications. Pages 275-291 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Brooks, W. H. 1969. Some quantitative aspects of the grass-oak woodland in Sequoia National Park. Unpubl. Rep., Sequoia Nat'l. Park, Three Rivers, Calif.

Burcham, L. T. 1975. Climate, structure, and history of California's annual grassland ecosystem. Pages 7-14 in R. M. Love, ed. The California annual grassland ecosystem. Univ. of California, Davis, Inst. of Ecol. Publ. No. 7.

Eyre, F. H., ed. 1980. Forest cover types of the Unites States and Canada. Soc. Amer. Foresters, Washington D.C.

Griffin, J.R. 1971. Oak regeneration in the upper Carmel Valley, California. Ecology 52:862-868.

Griffin, J. R. 1973. Xylem sap tension in three woodland oaks of central California. Ecology 54:152-159.

Griffin, J. R. 1977. Oak woodland. Pages 383-415 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Holland, V. L. 1976. In defense of blue oaks. Fremontia 4:3-8.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.

Pardo, R. 1978. National register of big trees. Amer. Forests. 84:17-47.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Pillsbury, N. H., and M. J. DeLasaux. 1983. Site, growth, and yield equations for blue oak and coast live oak in Monterey and San Luis Obispo Counties, California. Unpubl. Mimeo. Natur. Res. Manage. Dept., California Polytechnic State Univ., San Luis Obispo.

Sudworth, G. B. 1908. Forest trees of the Pacific slope. U.S. Govt. Printing Office.

Verner, J. 1980a. Birds of California oak habitats: management implications. Pages 246-264 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.) Gen. Tech. Rep. PSW-44.

Verner, J., and A. S. Boss tech. coords. 1980. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.

White, K. L. 1966. Structure and composition of foothill woodland in central coastal California. Ecology 47:229-237.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Coastal Oak Woodland

V. L. Holland
Updated by: CWHR Staff, April 2005

Vegetation

Structure. Coastal oak woodlands are extremely variable. The overstory consists of deciduous and evergreen hardwoods (mostly oaks 4.5-21 m (15 to 70 ft) tall sometimes mixed with scattered conifers. In mesic sites, the trees are dense and form a closed canopy. In drier sites, the trees are widely spaced, forming an open woodland or savannah. The understory is equally variable. In some instances, it is composed of shrubs from adjacent chaparral or coastal scrub which forms a dense, almost impenetrable understory. More commonly, shrubs are scattered under and between trees. Where trees form a closed canopy, the understory varies from a lush cover of shade-tolerant shrubs, ferns, and herbs to sparse cover with a thick carpet of litter. When trees are scattered and form an open woodland, the understory is grassland, sometimes with scattered shrubs. The interrelationships of slope, soil, precipitation, moisture availability, and air temperature cause variations in structure of coastal oak woodlands. These factors vary along the latitudinal, longitudinal and elevational gradients over which coastal oak woodlands are found.

Composition. Composition of both overstory trees and understory of coastal oak woodland varies and reflects the environmental diversity over which this habitat occurs. In the North Coast Range south to Sonoma County, coast live oak often does not dominate. Where Oregon white oak,California black oak, canyon live oak, madrone and interior live oak dominate, the habitat is generally considered Montane Hardwood (MHW).

From Sonoma County south, the coastal oak woodlands are usually dominated by coast live oak.In many coastal regions, coast live oak is the only overstory species. In mesic sites, trees characteristic of mixed evergreen forests mix with coast live oak, such as California bay, madrone, tanbark oak, and canyon live oak. On drier, interior sites, coast live oak mixes with valley oak, blue oak, and foothill pine.

Typical understory plants in dense coast live oak woodlands are shade tolerant shrubs such as California blackberry, creeping snowberry, toyon, and herbaceous plants such as bracken fern, California polypody, fiesta flower, and miner's lettuce. In drier areas where oaks are more widely spaced, the understory may consist almost entirely of grassland species with few shrubs, a\though a diversity of shrubs can occur under and between the trees with a sparse herbaceous cover. Where coast live oak woodlands intergrade with chaparral, species such as greenleaf manzanita, chamise, gooseberries, currants, and ceanothus species form the understory. Where the habitat intergrades with coastal scrub, typical understory species are bush monkeyflower, coyote brush, black sage, and California sagebrush.

From Ventura County south, floristic changes occur in coastal oak woodlands. There is little change in introduced species of forbs and grasses, but the native shrubs and herbs are more typical of southern California. The dominant trees of the southern oak woodlands are Engelmann oak, coast live oak, interior live oak, and California walnut. These occur in various mixtures, depending on location. Engelmann oak, a semi-deciduous white oak, is an ecological homologue of blue oak and replaces it in southern California. Interior live oak usually occurs at higher elevations in the interior mountains, often associated with rock outcrops. Coast live oak grows in moister sites, especially near the coast, but extends farther inland in southern California than it does elsewhere in its range. It often forms mixed stands with Engelmann oak in the foothills of the Peninsular Ranges. California walnut is locally dominant, with coast live oak between Santa Barbara and Orange Counties (Jepson 1910, Wieslander 1934 a, b, Swanson 1967). Coulter pine is sometimes a component of the coastal oak woodlands in mesic sites of southern and central California.

Other Classifications. Coastal oak woodland, as treated here, combines diverse oak-dominated vegetation types into one. For example, this habitat or portions of it are included in the Northern Oak Woodland, Southern Oak Woodland and Foothill Woodland of Munz (1973)(No Munz 1973 in Habitat Lit Cite.) and of Griffin (1977); the Southern Oak Forests of Küchler (1977); the Coast Live Oak and Engelmann Oak of Parker and Matyas (1981); the Southern Oak Woodland, Northern Oak Woodland and California Coast Live Oak Forest of Cheatham and Haller (1975); the Coast Live Oak and Engelmann Oak of Paysen, et al. (1980); the California Coast Live Oak and Mixed Forest Land of the Society of American Foresters classification (Eyre 1980); the Deciduous Forest Land, Evergreen Forest Land and Mixed Forest Land of the U.S.G.S. system (Anderson et al. 1976); and the Coastal Live Oak Woodland, Northern Oak Woodland and Southern Oak Woodland of Holland et al. (1983) and Holland and Keil (1987).

Habitat Stages

Vegetation Changes--1;2-5:S-D. Like other oak woodlands in California, successional trends in the COW have not been studied and remain largely unknown. Some species of deciduous oaks have not successfully reproduced for over 60 years (White 1966, Brooks 1971, Griffin 1971, 1976, Fieblekorn 1972, Snow 1972, Holland 1976). Evergreen oaks have been more successful and as a result appear to be gaining dominance in some areas (Griffin 1977). In other locations, it appears that coast live oak is being replaced by California bay as a result of grazing pressures and lack of successful regeneration (McBride 1974).

Jepson (1910), Cooper (1922), and Wells (1962)(Wells 1962 not in Habitat Lit Cite.) suggested that Indian burning in the past was important in maintaining some open stands of coastal oak woodland. Natural and manmade fires may still be important in some areas. Southern oak woodlands have apparently experienced an increase in periodicity of fires in recent years. Studies indicate that Engelmann oak and coast live oak are able to survive most fires (Snow 1979).

Most coastal oak woodlands are comprised of medium to large trees with few seedlings and saplings, especially in heavily grazed areas. Regeneration of most oaks in the coastal oak woodlands has not been studied thoroughly, but it is generally considered that they do not have the serious regeneration problems found with blue oak and valley oak. However, Engelmann oak is not adequately reproducing itself for reasons similar to those of blue oak.

Duration of Stages-- Coastal oak woodlands are comprised of slow growing, long-lived trees, so succession requires a long time. The actual time is variable and depends on local environmental conditions. Development of mature, large trees requires 60 to 80 years, and most of the trees of the coastal oak woodlands are at least this old. The best information available on succession in oak woodland, is historical. Since the Mission Period (17691824) and especially during the last century, marked changes have occurred in the coastal oak woodlands of California due to the introduction of domestic grazing animals and accompanying land management practices. The change in herbaceous understory from perennial species to aggressive, introduced annuals may have resulted in young oaks being out-competed for limited supplies of nutrients and moisture (Twisselmann 1967, Holland 1976). These changes have resulted in retrogressi e succession in which well-developed oak woodlands regress to open woodlands or savannas and eventually to disturbed grasslands. Even ubiquitous pioneer shrubs fail to become established as successfully in disturbed grassland. Woodcutting has also had an impact and in local areas has created "stump-prairies" because oaks have not successfully reinvaded after removal (Wells 1962). Land clearing and urban expansion have also destroyed extensive stands of coastal oak woodland.

Biological Setting

Habitat-- Coastal oak woodlands are common to mesic coastal foothills of California. The woodlands do not form a continuous belt, but occur in a mosaic closely associated with MCH CSC and AGS. Where moisture conditions are more favorable, such as north facing slopes and canyons, or higher elevations, COW grades into MHC or sometimes MCN habitats. From the coast toward the hotter, drier interior portions of the north and south coast range, COW grades into foothill woodlands (BOW), forming indistinct ecotones where the two overlap.

Wildlife Considerations -- Coastal oak woodlands provide habitat for a variety of wildlife species. Barrett (1980) reports that at least 60 species of mammals may use oaks in some way. Verner (1980) reports 110 species of birds observed during the breeding season in California habitats where oaks form a significant part of the canopy or subcanopy. Quail, turkeys, squirrels, and deer may be so dependent on acorns in fall and early winter that a poor acorn year can result in significant declines in their populations (Shields and Duncan 1966, Graves 1977, Schitoskey and Woodmansee 1978). Therefore, many wildlife managers are concerned over the continuing loss of coastal oak woodland habitats as a result of man's activities.

Physical Setting

Coastal oak woodlands occupy a variety of mediterranean type climates that vary from north to south and west to east. (The climate becomes hotter and drier toward the south and east.) Precipitation occurs in the milder winter months, almost entirely as rainfall, followed by warm to hot, dry summers. Near the coast, the summers are tempered by fogs and cool, humid sea breezes. Mean annual precipitation varies from about 100 cm (40 in) in the north to about 38 cm (15 in) in southern and interior regions. Mean minimum winter temperatures are 2 to 7 C (29 to 44 F), and the mean maximum summer temperatures are 24 to 36 C (75 to 96 F). The growing season ranges from six months (180 frost-free days) in the north to the entire year in mild coastal regions to the south. The soils and parent material on which coastal oak woodlands occur are extremely variable. In San Luis Obispo County alone they are found on over fifteen different parent materials ranging from unconsolidated siliceous sand to diatomaceous earth to serpentinite to volcanic ash and basalt (Wells 1962). Coastal oak woodlands generally occur on moderately to well-drained soils that are moderately deep and have low to medium fertility.

Distribution

Coastal oak woodlands occur in the coastal foothills and valleys from Trinity to Humboldt counties south through the coastal regions of the northern and southern coast range, the transverse and peninsular range of southern California. They extend beyond the counties of southern California into coastal Baja California, where they reach their southern limit (Griffin and Critchfield 1972). They occur at elevations from just above sea level near the immediate coast to about 1525 m (5000 ft) in the interior regions, especially in southern California.

Literature Cited

Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Dep. Interior, Geol. Surv., Prof. Pap. 964.

Barrett, R. H. 1980. Mammals of California oak habitats: management implications. Pages 275-291 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Brooks, W. H. 1971. A quantitative ecological study of the vegetation in selected stands of the grass-oakwoodland in Sequoia National Park, California. Progr. Rep., Sequoia-Kings Canyon Nat'l. Park, Three Rivers, Calif.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript
Cooper, W. S. 1922. The broad-sclerophyll vegetation of California. Carnegie Inst. Wash. Publ. 319.
Eyre, F. H., ed. 1980. Forest cover types of the Unites States and Canada. Soc. Amer. Foresters, Washington D.C.
Fieblekorn, C. 1972. Interim report of oak regeneration study. Unpub. Rep., Natur. Resources Cons. Office,Hunter Liggett Mil. Reserv., Jolon, Calif.
Griffin, J. R. 1967. Soil moisture vegetation patterns in northern California forests. U.S. Dep. Agric., For.Serv. (Berkeley, Calif.), Res. Pap. PSW-46.
Griffin, J.R. 1971. Oak regeneration in the upper Carmel Valley, California. Ecology 52:862-868.
Griffin, J. R. 1976. Regeneration in Quercus lobata savannas, Santa Lucia Mountains, California. Amer. Midl. Nat. 95:422-435.
Griffin, J. R. 1977. Oak woodland. Pages 383-415 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.
Griffin, J. R., and W. B. Critchfield. 1972. The distribution of forest trees in California. U.S. Dep. Agric., For. Serv. (Berkeley, Calif), Res. Pap. PSW-82.
Holland, V. L. 1976. In defense of blue oaks. Fremontia 4:3-8.
Holland, V. L., and D. Keil. 1987. California vegetation. El Corral Bookstore, California Polytechnic State Univ., San Luis Obispo.
Holland, V. L., D. J. Keil, D. R. Walters, and M. G. McLeod. 1983. Major plant communities of California. El Corral Bookstore, California Polytechnic State Univ., San Luis Obispo.
Jepson, W. L. 1910. The silva of California. Vol. 2. Univ. of California Mem. Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.
Holland, V. L. 1976. In defense of blue oaks. Fremontia 4:3-8.
McBride, J. 1974. Plant succession in the Berkeley Hills, California. Madroño 22:317-329.
Munz, P. A. 1974. A flora of southern California. Univ. of California Press, Berkeley.
Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.
Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.
Schitoskey, F., Jr., and S. R., Woodmansee. 1978. Energy requirements and diet of California ground squirrel. J. Wildl. Manage. 42:373-382.
Shields, P. W., and D. A. Duncan. 1966. Fall and winter food of California quail in dry years. Calif. Fish and Game 52:275-282.
Snow, G.E. 1972. Some factors controlling the establishment and distribution of Quercus agrifolia Nee and Q. engelmannii Greene in certain Southern California oak woodlands. Ph.D. dissertation, Oregon State Univ., Corvallis.

Snow, G. 1979. The fire resistance of Engelmann and coast live oak seedlings. Pages 62-67 in T. R. Plumb, tech. coord. Ecology, management and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.) Gen. Tech. Rep. PSW 44

Swanson, C. J. 1967. The ecology and distribution of Juglans californica in southern California. M. A. thesis, California State Univ., Los Angeles.

Twisselman, E. C. 1967. A flora of Kern Co., California Wassmann J. Biol. 25:1-395.

Verner, J. 1980a. Birds of California oak habitats: management implications. Pages 246-264 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley Calif.) Gen. Tech. Rep. PSW-44.

White, K. L. 1966. Structure and composition of foothill woodland in central coastal California. Ecology 47:229-237.

Wieslander, A. E. 1934a. Vegetation types of California, Pasadena Quadrangle (162D). U.S. Dep. Agric., For. Serv. map.

Wieslander, A. E. 1934b. Vegetation types of California, Pomona Quadrangle (163C). U.S. Dep. Agric., For. Serv. map.

Closed-Cone Pine-Cypress

Deborah B. Jensen

Vegetation

Structure-- This habitat includes a number of different series of evergreen, needle-leaved trees. The height and canopy closure of these series are variable and depend upon site characteristics, soil type, the age of the stand and the floristic composition (Cheatham and Haller 1975, Küchler 1977, Parker and Matyas 1981). The closed-cone pine habitats are similar to each other and will be described separately from the cypress habitats, although some of the series within this habitat contain both pine and cypress.

Cypress habitats may reach a height of 10 to 20 m (33 to 66 ft). The understory is a well-developed shrub layer of chaparral species (chamise and manzanita) on open, well-drained sites and a low, dense cover of shrubs and herbs on the poorly drained soils. On low nutrient or serpentinic soils the shrub layer cover is often less than 50 percent. Pine habitats typically reach heights of 30 m (66 ft). Most pine series have a shrub layer of chaparral species with high relative cover (up to 100% and a sparse herbaceous layer.

After fire, particularly on good sites, both cypress and pine habitats form dense, even-aged stands. As the stand matures, the stocking density decreases, but single species site dominance is common. Closed-cone Pine-Cypress habitats found along the extreme coast or on very shallow infertile soils contain stunted, wind-pruned individuals.

Composition-- This habitat is typically dominated by a single species of one of the closed-cone pines or cypress; few stands contain both pines and cypress. In general, associated species change as the dominant species changes. In southern California, cypress habitats are dominated by Tecate, Cuyamaca, or Piute cypress and contain species common to the surrounding chaparral such as chamise, manzanita, ceanothus and California buckwheat (Armstrong 1978).

MacNab and Sargent cypress, both northern California species, are frequently associated with foothill pine, leather oak, scrub oak, sticky whiteleaf manzanita and/or wedgeleaf ceanothus (Cheatham and Haller 1975, Vogl et al. 1977); the herbaceous layer may support a number of grasses and forbs. Sargent cypress stands are on moister slopes than the surroun (No Hardham 1982 Lit Cite. There is a Hardham 1962 cite.) ding chaparral stands (Koenig et al. 1982, Hardham 1982). Modoc cypress groves contain species from the adjacent yellow pine, juniper woodland or sage scrub habitats.

Along the immediate coast in Central California, Monterey cypress occurs in nearly pure stands with some salal and rhododendron in the understory. Gowen cypress associates with a number of north coastal shrub species, including rhododendron, Pacific bayberry and salal. Santa Cruz cypress stands, also found in Central California, include knobcone pine, ponderosa pine and silverleaf manzanita (Cheatham and Haller 1975, Vogl 1977, Küchler 1977). Mendocino pygmy cypress, the northern-most coastal cypress, may be codominant with pygmy pine. The understory in these stands has a number of northern shrub species associates including California huckleberry, labrador tea, glossyleaf manzanita and salal (Sholars 1983(No Sholars 1983 Lit Cite. I used Sholars 1982 for Lit Cite at end.), Westman and Whittaker 1975).

The pines which dominate Closed-cone habitats are knobcone pine, Monterey pine, Bishop pine, Torrey pine and beach pine. Knobcone pine frequently grows in small dense patches with chamise, ceanothus, leather oak and manzanita occurring between patches or in openings in the pine stands (Colwell 1980). Monterey pine stands include coast live oak and occasionally knobcone pine and madrone in the overstory. The shrubby understory includes California buckthorn, poison oak, California huckleberry and woolyleaf manzanita (Roy 1966). Shrubs associated with Bishop pine stands are typically those of the surrounding vegetation: California huckleberry, salal, rhododendron and labrador tea in the north, (Westman and Whittaker 1975) and chamise, manzanita, toyon and poison oak in the southern stands (Cole 1980). Torrey pine stands are very rare, two stands occur on the mainland and two on the Channel Islands. Associated woody vegetation includes manzanita, ceanothus and California sage. Beach pine habitats, found on stabilized dunes of the north coast, include bearberry manzanita, salal, Pacific bayberry and wavyleaf silktassel (Thorne 1976).

Other Classifications-- Other names of Closed-cone Pine-Cypress habitat include: MacNab Cypress, Sargent Cypress, Pygmy Cypress, Modoc Cypress, Piute Cypress, Knobcone Pine, Bishop Pine, Monterey Pine, Santa Cruz Cypress, Gowen Cypress, Monterey Cypress, Cuyamaca Cypress, Tecate Cypress, and Torrey Pine Series (Parker and Matyas 1981); Knobcone Pine - 248 (Colwell 1980), Closed-cone Coniferous Pine, Monterey Pine, and Torrey Pine Series, (Paysen et al. 1980), Closed-cone Pine Forest (Munz and Keck 1973), Coastal Cypress and Pine Forests (Küchler 1977), 42 Evergreen Forest Land (Anderson et al. 1980)(No Anderson et al.1980 Lit Cite. Only a Anderson et al. 1976.) and Closed-cone coniferous woodland, Shore pine woodland and Torrey pine woodland (Thorne 1976).

Habitat Stages

Vegetation Changes-- 1;2-5:S-D._Closed-cone pines and cypress retain their seeds in serotinous cones which remain on the branches. These habitats are true fire-climax or fire-dependent vegetation types, but fire may occur at any phase of the community. The heat of the fire causes the cones to release seeds which fall on the bare mineral soils. The full sunlight provided in early successional stages is excellent for seedling establishment and promotes the dense even-aged stands typical of all types of closed-cone pine and cypress habitats. Numerous "fire following" herbaceous species are abundant in the early successional stages following fire.

Duration of Stages-- Stand longevity varies greatly among types. For some, the fire frequency and life span are not known; other types are known to be short-lived. For example, knobcone has a short life span, with fire frequencies between 35-50 years. Individual knobcones which escape fire rarely live to 100 years of age (Vogl 1963)(No Vogl 1963 Lit Cite.). Tecate cypress do not produce cones until the trees are 10 years old and they reach maximum cone production at about 50 years (Zedler 1977). In contrast to these, small individuals of pygmy pine may be over 200 years old.

Biological Setting

Vegetation-- The cypress habitats usually occur as "arboreal islands" (Bowers 1961) within a matrix of chaparral or forest types. Similarly the pine habitats are patches in the surrounding chaparral, Montane Hardwood-Conifer or Mixed Conifer habitats.

Wildlife Considerations-- Numerous game species, including tree squirrels and band-tailed pigeons, and nongame species make use of this type for feeding and cover. Few species make substantial use of this type as a breeding habitat, although the great horned owl and red-tailed hawk will nest in closed-cone pine forests.

Physical Setting

Closed-cone Pine-Cypress habitats are typically found on sites that are more rocky and infertile than the surrounding soils. Many stands (especially of knobcone pine, and Sargent and MacNab cypress) are found on serpentine soils. Although, typically found at low elevations, due to the coastal distribution of much of this habitat type, interior stands may be found at elevations up to 2000 m (6550 ft). Landforms are gentle to steep slopes where stands occur in interior California and coastal terraces or bluffs where distributed along coastal California.

Distribution

Closed-cone pine-cypress occurs in patches as an interrupted forest along coastal California from southern San Diego county north to Oregon. Inland, the distribution is a few widely scattered locations in the Peninsular and Coast Ranges and in the North and Central Sierra Nevada. Monterey Cypress occurs naturally in two locations on the Monterey peninsula. Elevations range from nearly sea level to approximately 2000 m (6550 ft) (Griffin and Critchfield 1972, Cheatham and Haller 1975).

Literature Cited

Armstrong, W. P. 1978. Southern California's vanishing cypresses. Fremontia 6(2):24-29.

Bowers, N. A. 1961. Cone-bearing trees of the Pacific Coast. Pacific Books, Palo Alto, Calif.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Cole, K. 1980. Geological control of vegetation in the Purisima Hills, California. Madroño 27:79-89.

Griffin, J. R., and W. B. Critchfield. 1972. The distribution of forest trees in California. U.S. Dep. Agric., For. Serv. (Berkeley, Calif), Res. Pap. PSW-82.

Koenig, R. L., W. A. Williams and M. B. Jones. 1982 Factors affecting vegetation on a serpentine soil: Principal components analysis of vegetation data Hilgardia 50(4):1-14.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. Univ. of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.

Sholars, R. E. 1982. The pygmy forest. Black Bear Press, Mendocino, Calif.

Thorne, R F. 1976. The vascular plant communities of California. Pages 1-31 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. 2.

Vogl, R. J. 1977. Fire frequency and site degradation. Pages 193-201 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv. Gen. Tech. Rep. W0-3.

Vogl, R. J., W. P. Armstrong, D. L White, and K. L. Cole 1977. The closed-cone pines and cypress. Pages 295-358 In M. G. Barbour and J. Major eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Westman, W. E., and R. H. Whittaker. 1975. The pygmy forest region of northern California: studies on biomass and primary productivity. J. Ecology 63:493-520.

Zedler, P. H. 1977. Life history attributes of plants and the fire cycle: a case study in chaparral dominated by Cypressus forbesii. Pages 451-458 In H. A. Mooney and C. E. Conrad, tech. coords. Symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Dep. Agric., For. Serv. (Washington, D.C.) Gen. Tech. Rep. W0-3.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Douglas-Fir

Martin G. Raphael

Vegetation

Structure-- This habitat forms a complex mosaic of forest expression due to the geologic, topographic, and successional variation typical within its range (Sawyer 1980). Typical aggregations include a lower overstory of dense, sclerophyllous, broad-leaved evergreen trees (tanoak, Pacific madrone) up to 35 m (114 ft) tall, with an irregular, often open, higher overstory of tall needle-leaved evergreen trees (Douglas-fir) up to 90 m (295 ft) (Marcot 1979, Sawyer 1980, Franklin et al. 1981, Thornburgh 1982). A small number of pole and sapling trees occur throughout stands (Thornburg 1982). On wet sites, shrub layers are well developed, often with 100 percent cover. Cover of the herbaceous layer under the shrubs can be up to 10 percent. At higher elevations, the shrubs disappear and the herb layer is often 100 percent. Typical mesic habitats have a poorly developed or non-existent shrub and herb layer. Dry habitats have greater cover of shrubs and especially grasses (Franklin and Dyrness 1973, D. A.Thornburgh, pers. comm.). On steeper (> 75%), drier slopes with shallow soils, the shrub and herb layer is poorly developed, represented mainly by moss-covered rocks (Sawyer et al. 1977). Diameter of overstory Douglas-fir ranges up to 450 cm (1140 in) and averages 150 to 220 cm (360 to 560 in) on better sites (Franklin and Waring 1980). Density of Douglas-fir decreases with stand age from about 400 stems >2 m tall/ha (160/ac) in 100-year old stands to 290 stems/ha (116/ac) in 250-year-old stands; density of other species increases from 765 to 1212 stems/ha (306 to 490/ac) M. G. Raphael, unpublished data). In a study of similar forests in Oregon, overstory foliage biomass was similar in young (37-year-old) stands, but understory biomass was nine times greater in the older stand (Grier et al. 1974). Mature overstory Douglas-fir trees have a typically cylindrical crown beginning at 20 to 40 m (66 to 131 ft), composed of irregularly scattered branches (Franklin et al. 1981). Diversity of tree size typically increases with stand age, as does tree spacing (Franklin et al. 1981). Young stands have closely spaced and uniformly distributed trees, whereas older stands show a more patchy stem distribution. Snags and downed logs, an important structural component of this habitat, increase in density or volume with stand age (Franklin and Waring 1980, Raphael and Barrett 1984).

Composition-- Overstory composition varies with soil parent material, moisture, topography, and disturbance history. Dry steep slopes on metamorphic and granitic parent materials are dominated by canyon live oak. Less rocky, dry soils support Douglas-fir, tanoak, and Pacific madrone in association with sugar pine, ponderosa pine, black oak, and canyon live oak. Deep mesic soils support an overstory of Douglas-fir with a tanoak-dominated understory. Wettest sites include Pacific yew and, less consistently, Port-Orford cedar. On ultrabasic derived soils, Douglas-fir attains less dominance and is replaced by Port-Orford cedar on mesic sites to the extreme northwest (Stein 1980a) and open stands of Jeffrey pine, incense cedar, sugar pine, knobcone pine, and western white pine on more xeric sites (Whittaker 1960, Whittaker 1961, Rockey et al. 1966, Mize 1973, Sawyer et al. 1977). In the southern and eastern extent if the type, ponderosa pine becomes a major codominant with Douglas-fir, and cover of black oak increases (Waring and Major 1964, Sawyer et al. 1977). In the absence of fire or other disturbance, western hemlock may occur as a codominant with Douglas-fir and tanoak at the western extent of the type in areas transitional to redwood forest (Sawyer et al. 1977). The shrub layer is typically composed of canyon live oak, Oregon-grape, California blackberry, dwarf rose, and poison-oak (Franklin and Dyrness 1973). Mesic sites support vine maple, California hazel, salal, and Pacific rhododendron (Sawyer et al. 1977). On sedimentary soils, the principal understory shrubs are California huckleberry, snowbrush ceanothus, salal, and Oregon-grape. Ultrabasic soils support a shrub layer of huckleberry oak, shrub tanoak, California-laurel, California buckthorn, and Brewer oak (Whittaker 1960). Forbs and grasses include Pacific trillium, western swordfern, insideout flower, broad-leaf starflower, deervetch vanillaleaf, American deervetch, princes pine, common whipplea, California honeysuckle, American trailplant, whitevein shinleaf, western rattlesnake plantain, Sierra fairy bells, bracken fern, western fescue, common beargrass, and hartford oniongrass (Franklin and Dyrness 1973, Sawyer et al. 1977). Mize (1973), Simpson (1980), and Laidlaw-Holmes (1981) discuss understory composition in relation to parent material and soil moisture.

Other Classifications-- Other names for Douglas-fir habitat include Douglas-fir-Tanoak-Madrone, Douglas-fir-Pine-Madrone, Douglas-fir Series (Parker and Matyas 1981), Port-Orford-Cedar-231 (Stein 1980a), Douglas-fir-Tanoak-Pacific Madrone -234(Sawyer 1980), Western Hemlock Forest -8.22, and Douglas-fir Forest -8.24 (Cheatham and Haller 1975), Douglas-fir Forest -13(Munz and Keck 1959), Evergreen Forest Land -42 (Anderson et al. 1976), Mixed-Evergreen Zone (Franklin and Dyrness 1973), Pseudotsuga-Hardwood Forest (Sawyer et al. 1977), Mixed Evergreen Forest with Chinquapin, and Mixed Evergreen Forest with Rhododendron (Küchler 1977), and Mixed Evergreen Forest(Marcot 1979).

Habitat Stages

Vegetation Changes-- 1; 2-5:S-D;6. After a major disturbance, Douglas-fir habitats can proceed through structural classes 1-5, although the sequence is often truncated on poorer sites. Stage 6 stands occur when periodic disturbance leads to a multi-aged stand or a shade tolerant understory develops. This habitat can exist as any of the canopy closure classes S-D, although class D is most frequent. After logging or intense fire, tanoak regenerates by sprouting and Douglas-fir by seeding. Good seed years are irregular, with peaks at about seven-year intervals (Thornburg 1982). Tanoak sprouts grow faster than Douglas-fir seedlings and initially dominate along with various shrubs and herbs. Tanoak can form a nearly solid canopy for 60 to 100 years until natural mortality allows Douglas-fir to become dominant. In mixed stands of tanoak and

Douglas-fir, the latter overtops tanoak in 15 to 30 years on mesic sites (Thornburgh 1982). On xeric sites, hardwoods dominate longer. Thus, abundance and growth of tanoak sprouts depends on the structure of the previous stand and on available soil moisture. Over the course of succession, grasses, herbs, and shrubs are most abundant in the seedling tree class, least abundant in pole and small tree classes, and moderately abundant in the medium/large tree class. Snag and log volume also increase with stand age.

Duration of Stages-- Because of frequent fires, typical climax Douglas-fir habitat is rare (Thornburgh 1982). In the absence of disturbance, such stands develop in 80 to over 250 years, depending on site quality (McArdle 1961, Lang 1980). Individual Douglas-fir trees can live to 1250 years; ages in excess of 750 years are common (Franklin and Waring 1980). Following disturbance, the seedling tree class persists for 5 to 20 years, depending on site quality. The sapling tree class can be 5 to 60 years old the pole-tree, small tree, and medium large tree classes can be 20 to 130, 35 to over 130, and 80 to over 250 years, respectively (McArdle 1961, Lang 1980, Franklin et al. 1981). Multilayered (class 6) stands probably develop over the same time period as medium/large tree stands.

Biological Setting

Habitat-- Douglas-fir occurs at low to moderate elevations in juxtaposition with a number of other habitats. Redwood (RDW) occurs at lower elevations to the west, and Mixed Conifer (MCN) occurs to the east and at higher elevations within the range of Douglas-fir. To the north, especially in more mesic sites, this habitat is bounded by hemlock and sitka spruce zones of Franklin Dyrness (1973)(No 1973 cite. Only a 1969 Cite. Not placed in Lit Cite at enc.). More xeric sites to the south are bounded by and interspersed with Valley-Foothill Hardwood (VFH) and Valley-Foothill Hardwood-Conifer (VHC). ther habitats, such as Montane Hardwood (MHW), Montane Hardwood Conifer (MHC), Montane Riparian (MRI) and Montane Chaparral (MCP) form a complex mosaic with Douglas-fir at similar elevations (Sawyer et al.1977).

Wildlife Considerations-- This habitat supports a high abundance of wildlife species. Weins (1975)(Not in Habitat Lit Cite.) reported that northwest coastal coniferous forests supported a higher average bird density than any other forest type in North America. Bird species typical of this habitat include spotted owl, western flycatcher, chestnut-backed chickadee, golden-crowned kinglet, Hutton's vireo, solitary vireo, hermit warbler, and varied thrush. Among amphibians and reptiles, the distributions of northwestern salamander, Pacific giant salamander, Olympic salamander, Del Norte salamander, black salamander, clouded salamander, tailed frog, and northwestern garter snake are largely coincident with the distribution of Douglas-fir habitat. Although not restricted to this habitat, the ensatina is its most abundant amphibian. Typical mammals include fisher, deer mouse, dusky-footed woodrat western redbacked vole, creeping vole, Douglas' squirrel, Trowbridge's shrew, and shrew-mole.

Physical Setting

Climatically, this habitat experiences hot, dry summers and cool, mild, wet winters. Mean July temperatures range from 14 to 22 C (57-72 F). Average January temperatures range from 0 to 8 C (32-46 F) (Proctor et al. 1980). Annual precipitation varies from 60 to 170 cm (24-27 in), generally less than 15 percent falling during summer. Precipitation increases inland and at higher elevations. Snowfall ranges from 3 to 80 cm (2 to 31 in) and rarely persists later than June (Proctor et al. 1980). Topography is characterized by rugged, deeply dissected terrain and steep slopes (Franklin and Dyrness 1973), especially toward the south. Major soil types are based on sedimentary granitic, and ultramafic parent materials of gabbro, peridotite, and serpentine (Whittaker 1960).

Distribution

Douglas-fir habitat occurs in the north Coast Range from Sonoma County north to the Oregon border and in the Klamath Mountains of California and Oregon. This habitat usually occurs at elevations from 150 to 600 m (500 to 2000 ft) in the Coast Range and from 300 to 1200 m (1000 to 4000 ft) in the Klamath Mountains. It can occur at higher elevations if plentiful precipitation is present (Sawyer 1980).

Literature Cited

Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Dep. Interior, Geol. Surv., Prof. Pap. 964.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Franklin, J. F. and C. T. Dyrness. 1969, 1973. Natural vegetation of Oregon and Washington.U.S. Dep. Agric., For. Serv. (Portland, Ore.), Gen. Tech. Rep. PNW-80.

Franklin, J. F., and R. H. Waring. 1980. Distinctive features of the northwestern coniferous forest: development structure, and function. Pages 59-86 In R. H. Waring, ed. Forests: fresh perspectives from ecosystem analysis. Oregon State Univ. Press, Corvallis.

Franklin, J. F., K. Cromack, Jr., W. Denison, A. McKee, C. Maser, J. Sedell, F. Swanson, and G. Juday.1981 Ecological characteristics of old-growth Douglas-fir forests. U.S. Dep. Agric., For. Serv. (Portland, Ore.), Gen. Tech. Rep. PNW-118.

Grier, C. C., D. W. Cole, C. T. Dyrness, and R. L. Fredriksen.1974. Nutrient cycling in 37- and 450-year old Douglas-fir ecosystems. Pages 21-34 In R. H. Waring and R. L. Edwards, eds. Integrated research in the coniferous forest biome. U.S. Int. Biol. Prog., Ecosystem Anal. Studies, Conf., For. Biome Bull. 5.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Laidlaw-Holmes, J. M. 1981. Forest habitat types on metasedimentary soil of the South Fork Mountain region of California. M.S. thesis, Humboldt State Univ., Arcata, Calif.

Lang, F. J. 1980. Old-growth forests of the Douglas-fir region of western Oregon and western Washington: characteristics and management Jones and Stokes Assoc., Sacramento, Calif.

Marcot, B. G., ed. 1979. Introduction Vol. I. California wildlife/habitat relationships program north coast/cascades zone. U.S. Dep. Agric., For. Serv., Six Rivers Nat'l. Forest, Eureka, Calif.

McArdle, R. E.1961. The yield of Douglas fir in the Pacific Northwest. U.S. Dep. Agric., Tech. Bull. 201.

Mize, C. W. 1973. Vegetation types of lower elevation forests in the Klamath Region, California. M.S. thesis Humboldt State Univ., Arcata.

Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.

Raphael, M. G., and R. H. Barrett. 1984. Diversity and abundance of wildlife in late successional Douglas-fir forests. Pages 352-360 in Proc.1983 Soc. Amer. Foresters Nat'l. Conv., Soc. Amer. Foresters 84-03.

Rockey, R. E., K. E. Bradshaw, and A. G. Sherrell. 1966. Interim report, soil-vegetation survey. U. S. Dep. Agric., For. Serv., Six Rivers Nat'l. Forest, Orleans Ranger Dist., Orleans Calif.

Simpson, L. G. 1980. Forest types on ultramafic parent materials of the southern Siskiyou Mountains in the Klamath region of California. M.S. thesis, Humboldt State Univ., Arcata.

Sawyer, J. O., D. A. Thornburgh, and J. R. Griffin. 1977. Pages 359-382 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Sawyer, J. O. 1980. Douglas fir-tanoak-Pacific madrone 234. Pages 111-112 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.

Stein, W. l. 1980a. Port Orford-cedar 231. Pages 108-109 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.

Thornburgh, D. A. 1982. Succession in the mixed evergreen forests of northwestern California. Pages 87-91 In J. E. Means, ed. Forest Succession and stand development research in the northwest. Oregon State Univ., Corvallis.

Waring, R. H., and J. Major. 1964. Some vegetation of the California redwood region in relation to gradients of moisture, nutrients, light, and temperature. Ecol. Monogr. 34:167-215.

Whittaker, R. H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecol. Monogr. 30:270-338.

Whittaker, R. H. 1961. Vegetation history of the Pacific coast states and the "central" significance of the Klamath region. Madroño 16:5-23.

Eucalyptus

Daniel C. Pearson

Vegetation

Structure-- Eucalyptus habitats range from single-species thickets with little or no shrubby understory to scattered trees over a well-developed herbaceous and shrubby understory. In most cases, eucalyptus forms a dense stand with a closed canopy. Stand structure for this habitat may vary considerably because most eucalyptus have been planted into either rows for wind protection or dense groves for hardwood production and harvesting (Cornell 1909, U.S. Forest Service 1933). Eucalyptus is often found in monotypic stands. The genus is composed of over 150 species with high morphological diversity (Cornell 1909). Thus, habitat structure may be affected if more than two or three species coexist. Tree size may vary considerably depending on spacing and species. Typically, trees may range in height from 26 to 40 m (87 to 133 ft) and have diameters (dbh) of 21.8 to 38.4 cm (8.6 to 15.1 in) (Walters 1980), with most growth occurring in the first 15 years. Trees in excess of 46 to 80 m (152 to 264 ft) are not uncommon (Munz 1974, Walters 1980).

Composition-- Overstory composition is typically limited to one species of the genus, or mixed stands composed of other species of the same genus; few native overstory species are present within eucalyptus planted areas, except in small cleared pockets (Fenwick 1980). The most common species is blue gum followed by red gum (Munz 1974, Smith 1976). Hybridization between species is known to occur (Smith 1976, Fenwick 1980). Typical understory species may vary depending on whether or not the trees were artificially established into groves or rows or have escaped and become independently established. In groves or rows, the understory is commonly composed of a host of annual grasses (mostly introduced Mediterranean and European species of the genus Bromus), and other weedy species including mustard, thistle, spurge, cheeseweed, and prickly pear cactus. The allelopathic nature of eucalyptus and litter deposition often prevents the establishment of any significant shrubby understory (McArthur 1962, Smith 1976). Where trees of this genus are established as small groves in native plant communities, understory species typically include coastal sage, chamise, manzanita, buckwheat, toyon, scrub oak, mountain mahogany, and assorted annuals. Eucalyptus is also known to become established along stream courses, encroaching upon existing riparian vegetation.

Other Classifications-- No other classifications are specified for this habitat. However, the habitat is often included in general habitat classifications of disturbed, agricultural, and urban sites.

Habitat Stages

Vegetation Changes-- 1;2-5:S-D. Most species of eucalyptus are characterized by adaptations that allow them to survive and recover quickly from disturbances like fire. Most eucalyptus produce epicormic shoots from any undamaged region of the cambium (McArthur 1967, Fenwick 1980, King and Krugman 1980). Even if totally killed by some disturbance, many eucalyptus produce subsurface ground shoots from lignotubers. For non-lignotuberous eucalyptus, the ability to seed heavily and produce heavy natural regeneration suggest that this genus has adapted to a constant environment of fire (McArthur 1967). These adaptations allow this habitat to recover quickly from disturbance, permitting limited succession or development to other habitats. At most, following a fire or some other disturbance, increased growth of the understory usually an annual grassland can be expected until the eucalyptus can regenerate through epicormic shoots and lignotuber sprouting.

Duration of Stages-- Eucalyptus are characterized as having rapid growth from shoots and seedlings, with trees attaining 70 to 90 percent of their height within 15 years after planting (Walters 1980). Annual height growth of trees in experimental plots has averaged 4.3 m (14 ft) for the first 5 years, 1.2 m (4 ft) for the second 5 years, and about 0.3 m (1 ft) for the third 5 years (Walters 1980). Ten-year-old trees can easily achieve heights of 30 to 33 m (90 to 100 ft) (Howell 1982). Canopy closure is achieved in a fairly short period.

Biological Setting

Vegetation-- Eucalyptus woodlands generally adjoin a number of other wildlife habitats and are found at low elevations, where freezing is not a problem. Most eucalyptus have been artificially established, usually in and around urban/rural areas. Other habitats found in proximity to eucalyptus include cropland, valley foothill riparian, Orchard-vineyard, Coastal Scrub, Chamise Redshank Chaparral, Annual Grass, Pasture and Residential Park.

Wildlife Considerations-- Characteristic species of this habitat include crow, raven, barn owl, and red-tailed and red-shouldered hawks. Eucalyptus are important as roosts, perches, and nest sites for a number of bird species, particularly raptors. Those eucalyptus with stringy bark or a tendency for rapid deposition of litter, create micro habitats for a number of small vertebrate species, including alligator lizard, gopher snake, and woodrat.

Physical Setting

Eucalyptus habitats have been extensively planted throughout the state since their introduction in 1856 with large-scale planting operations beginning in 1870 (Cornell 1909, Howell 1982). As such, they are found in locations with highly variable site characteristics. Generally, they are found on relatively flat or gently rolling terrain, occasionally in the foothills. Climatic conditions are typically referred to as Mediterranean, characterized by hot, dry summers and cool, mild winters. Precipitation ranges from approximately 30 cm (12 in) to 60 cm (24 in). Temperature regimes in areas of eucalyptus groves range from a mean monthly low of 6 C (43 F) in January to 23 C (73 F) in August, with low temperatures occasionally reaching 0 to 4 C (32 to 25 F) and high temperatures typically exceeding 38 C (100 F) (King and Krugman 1980). Eucalyptus demonstrates the ability to withstand many temperature conditions, with the exception of prolonged cold or freezing weather (U.S. Forest Service 1933, King and Krugman 1980). Eucalyptus should not be planted where temperatures are consistently lower than 5 C (24 F) (Cornell 1909).

Distribution

Eucalyptus occurs in California from San Diego and Imperial counties in the south, usually at elevations below 500 m (1500 ft), but it has been found up 700 m (2100 ft); and to Shasta in the north (Cornell 1909). Most eucalyptus, however, is found around populated areas of southern and central California.

Literature Cited

Cornell, F. D. 1909. Hickory's younger brother. Sunset Magazine (March):274-281.

Fenwick, R. 1980. Proposed fire management plan for the Lake Chabot Eucalyptus plantation.East Bay Reg. Parks Dist., Oakland, Calif.

Howell, J. A. 1982. Bay area Eucalyptus fire hazard. U.S. Dep. Interior, Nat'l. Park Serv., San Francisco, Calif. Unpubl. MS.

King, J. P., and S. L Krugman. 1980. Tests of 36 Eucalyptus species in northern California. U.S. Dep. Agric For. Serv. (Berkeley, Calif.), Res. Pap. PSW-152. Kirkpatrick, J. B., and C. F. Hutchinson. 1977. The community composition of Californian USA coastal sage scrub. Vegetation 35:21-33.

McArthur, A. G. 1962. Control burning of eucalyptus forests. 8th Commonwealth Forestry Conf. (Canberra Australia), Forestry and Timber Bureau, Leaflet No. 80.

Munz, P. A. 1974. A flora of southern California. Univ. of California Press, Berkeley.

Smith, C. F. 1976. A flora of the Santa Barbara region, California. Santa Barbara Mus. of Natur. Hist Santa Barbara, Calif.

Walters, G. A. 1980. Saligna Eucalyptus growth in a 15-year old spacing study in Hawaii. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Res. Pap. PSW-151.

Montane Hardwood-Conifer

Richard Anderson

Vegetation

Structure-- Montane Hardwood-Conifer (MHC) habitat includes both conifers and hardwoods (Anderson et al. 1976), often as a closed forest. To be considered MHC, at least one-third of the trees must be conifer and at least one-third must be broad-leaved (Anderson et al. 1976). The habitat often occurs in a mosaic-like pattern with small pure stands of conifers interspersed with small stands of broad-leaved trees (Sawyer 1980). This diverse habitat consists of a broad spectrum of mixed, vigorously growing conifer and hardwood species. Typically, conifers to 65 m (200 ft) in height form the upper canopy and broad-leaved trees 10 to 30 m (30 to 100 ft) in height comprise the lower canopy (Proctor et al. 1980, Sawyer 1980). Most of the broad-leaved trees are sclerophyllous evergreen, but winter-deciduous species also occur (Cheatham and Haller 1975).

Relatively little understory occurs under the dense, bilayered canopy of MHC. However, considerable ground and shrub cover can occur in ecotones or following disturbance such as fire or logging. Steeper slopes are normally devoid of litter; however, gentle slopes often contain considerable accumulations of leaf and branch litter (Cheatham and Haller 1975).

Composition-- Common associates in MHC are ponderosa pine, Douglas-fir, incense-cedar, California black oak, tanoak, Pacific madrone, Oregon white oak, and other localized species. Species composition varies substantially among different geographic areas.

In the north coast, California black oak, Oregon white oak, golden chinquapin, and canyon live oak are commonly found with white fir, Douglas-fir, and ponderosa pine (Parker and Matyas 1981). In the Klamath Mountains and north coast from the Oregon border to Marin County, Oregon white oak, tanoak, Pacific madrone, red alder, Douglas-fir, western red cedar, western hemlock, ponderosa pine, sugar pine, and knobcone pine are common (Küchler 1977, McDonald 1980(Is it a or b Lit Cite), Parker and Matyas 1981). In the northern interior, California black oak, bigleaf maple, Pacific madrone, and tanoak are common with ponderosa pine, white fir, incense-cedar, Douglas-fir, and sugar pine forming the overstory. In the northern Sierra Nevada, common associates include California black oak, bigleaf maple, white alder, dogwood, Douglas-fir, incense-cedar and ponderosa pine. In the southern Sierra Nevada, common associates include California black oak, black cottonwood, canyon live oak, Jeffrey pine, Douglas-fir, ponderosa pine, sugar pine, incense-cedar, and localized areas of giant sequoia (Küchler 1977, Parker and Matyas 1981). In the central coast, common associates include coast live oak, big leaf maple, Pacific madrone, tanoak, canyon live oak, Coulter pine, coastal redwood and, to a lesser extent, California black oak and ponderosa pine. In the northern central coast, Douglas-fir is found; while in the southern areas, bigcone Douglas-fir occurs. In the Tehachapi, transverse and peninsular ranges of Southern California, common associates include canyon live oak, Pacific madrone, coast live oak and, to a lesser extent, California black oak, ponderosa pine, sugar pine, and incense-cedar (Thorne 1976, Küchler 1977, Parker and Matyas 1981).

Other Classifications-- Montane Hardwood-Conifer is very diverse and has been given a variety of names in the literature including: Mixed Evergreen Forest (Munz and Keck 1973); Mixed Evergreen Zone - Second Growth Forest (Broadleaf 1.1.1H) (Mixed 1.2.31) (Proctor et al. 1980); Mixed Evergreen Forest with Chinquapin, Mixed Hardwood Forest, Mixed Hardwood and Redwood Forest, Oregon Oak Forest, Coulter Pine Forest (Küchler 1977); Mixed Evergreen Forest, Coast Range Mixed Conifer Forest, Santa Lucia Fir Forest, Coast Range Ponderosa Pine Forest, Coulter Pine Forest (Cheatham and Haller 1975); Santa Lucia Fir Series, Bigcone Douglas-fir Series, Madrone Series and Black Oak Series (Paysen 1980)(No Paysen 1980 Lit Cite. There is a Paysen et al. Cite.); Oregon White Oak (Stein 1980); California Black Oak (McDonald 1980); Douglas-fir-Tanoak-Pacific Madrone (Sawyer, 1980); Black Oak Series, Maple-Alder-Dogwood Series, Mixed Conifer-Pine Series, Madrone-Tanoak Series (Parker and Matyas 1981).

Habitat Stages

Vegetation Changes-- 1;2-5:S-D;6. This habitat is climax in most cases; however, it can occur as a seral stage of mixed conifer forests. Vegetation response following disturbance, such as fire or logging, begins with a dense shrubby stage dominated by taller broad-leaved species. The stand gradually increases in height, simultaneously developing into two canopy strata with faster growing conifers above and broad-leaved species below. On mesic sites the conifer component overtakes the hardwood component more rapidly than on xeric sites, where the hardwood component is dominant longer (McDonald 1980).

Duration of Stages-- Secondary succession following disturbance is vigorous, with shrubs and trees regenerating together. The conifer component develops into relatively large, mature trees within 30 to 50 years. The broad-leaved component normally requires 60-90 years. Eventually the conifer component overtakes the broad-leaved component. Successional sequence and timing varies geographically and differs depending on species and environmental factors such as climate, water, and soil.

Biological Setting

Habitat-- Geographically and biologically, Montane Hardwood-Conifer is transitional between dense coniferous forests and montane hardwood, mixed chaparral, or open woodlands and savannahs. MHC merges with many other habitats at its upper and lower ecotones. These habitats include Valley-Foothill Hardwood (VFH), Valley-Foothill Hardwood-Conifer (VHC), Valley-Foothill Riparian (VRI), Closed-Cone Pine-Cypress (CPC), Montane Hardwood (MHW), Mixed Conifer (MCN), Douglas-fir (DFR), Redwood (RDW), Montane Riparian (MRI), Montane Chaparral (MCP), and Mixed Chaparral (MCH). The habitat is an area of vegetational and floristic diversity with large numbers of endemic species (Proctor et al. 1980).

Wildlife Considerations-- Montane Hardwood-Conifer provides habitat for a variety of wildlife species. Mature forests are valuable to cavity nesting birds. Moreover, mast crops are an important food source for many birds as well as mammals. Canopy cover and understory vegetation are variable which makes the habitat suitable for numerous species. In mesic areas, many amphibians are found in the detrital layer. Due to geographic variation in components of Montane Hardwood-Conifer, caution must be exercised when predicting wildlife species use.

Physical Setting

Montane Hardwood-Conifer generally occurs on coarse, well drained mesic soils, in mountainous terrain with narrow valleys. Slopes average approximately 57 percent with all aspects encountered. Winters are cool and wet; summers are hot and dry. Northern California Montane Hardwood-Conifer sites have less rainfall and fog than Redwood (RDW) or Mixed Conifer (MCN) habitats. In southern California, this habitat is found at higher elevations, and in moist canyons. Average rainfall is 60 to 170 mm (25 to 65 in), with some fog. The growing season is 7 to 11 months, with 200 to 300 frost-free days. Mean summer maximum temperatures are 25 to 36 C (75 to 95 F). Mean winter minima are 2 to 4 C (29 to 30 F) (Munz and Keck 1970)(No Munz and Keck 1970 Lit Cite).

Distribution

Montane Hardwood-Conifer occurs throughout California and is somewhat continuous from Santa Cruz County northward through outer coast range into Oregon, usually some distance inland m the coast (Cheatham and Haller 1975). The habitat typically lows the upper and/or inland margins of the coastal redwood RDW) or Douglas fir (DFR) habitats. It can also be found on north facing slopes of the inner north coast ranges, the Santa Lucia Mountains, as well as small patches extending to Santa Barbara County (Cheatham and Haller 1975). Montane Hardwood-Conifer also occurs somewhat continuously down the Sierra Nevada to the transverse ranges. Elevations range from 300 to 10 m (1000 to 4000 ft) in the north to 605 to 1760 m (2000 to 00 ft) in the south. Isolated patches of MHC can be found throughout the transverse and peninsular ranges of southern California.

Literature Cited

Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Dep. Interior, Geol. Surv., Prof. Pap. 964.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. Univ. of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.

Sawyer, J. O. 1980. Douglas fir-tanoak-Pacific madrone 234. Pages 111-112 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.

Stein, W. l. 1980b. Oregon white oak. Pages 110-111 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.

Thorne, R F. 1976. The vascular plant communities of California. Pages 1-31 In J. Latting, ed. Plant communities of southern California. Calif. Native Plant Soc. Spec. Publ. 2.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Montane Hardwood

Philip M. McDonald

Vegetation

Structure-- A typical montane hardwood habitat is composed of a pronounced hardwood tree layer, with an infrequent and poorly developed shrub stratum, and a sparse herbaceous layer. On better sites, individual trees or clumps of trees may be only 3 to 4 m (10 to 13 ft) apart. On poorer sites, spacing increases to 8 to 10 m (26 to 33 ft). Where trees are closely spaced, crowns may close but seldom overlap. Living crowns on mature canyon live oaks occupy about 60 percent of the bole on typical sites and up to 80 percent on poor sites. Tree heights tend to be uniform at most ages in mature stands where hardwoods occur, but subordinate to conifers. Mature oaks on better sites and in canyons range between 17 and 30 m (56 and 98 fl) tall and up to 150 cm (59) in) dbh. On poorer sites, mature trees typically are 10 to 15 m (33 to 49 ft) tall with boles up to 65 cm (26 in) in dbh, with dome-shaped crowns almost as wide as the trees are tall. On rocky summits, canyon live oak is a shrub of small diameter, usually less than 4 m (13 ft) in height. Snags and downed woody material generally are sparse throughout the montane hardwood habitat.

Composition-- In the Coast Range and Klamath Mountains, canyon live oak often forms pure stands on steep canyon slopes and rocky ridge tops. It is replaced at higher elevations by huckleberry oak (Parker and Matyas 1980)(No 1980 Lit Cite only 1979 and 1981.). At higher elevations, it is scattered in the overstory among ponderosa pine, Coulter pine, California white fir, and Jeffrey pine, the latter on serpentine and peridotite outcrops. Middle elevation associates are Douglas-fir, tanoak, Pacific madrone, California-laurel, California black oak, and bristlecone fir. Knobcone pine, foothill pine, Oregon white oak, and coast live oak are abundant at lower elevations. Understory vegetation is mostly scattered woody shrubs (manzanita, mountain-mahogany, poison-oak) and a few forbs.

In the Transverse and Peninsular ranges of southern California, overstory associates at middle and higher elevations are Jeffrey pine, ponderosa pine, sugar pine, incense-cedar, California white fir, bigcone Douglas-fir, California black oak, and Coulter pine. At lower elevations, associates are white alder, coast live oak, bigleaf maple, California-laurel, bigcone Douglas-fir, and occasionally valley oak, foothill pine, and blue oak (Cheatham and Haller 1975, McDonald and Littrell 1976). Understory shrub species are manzanita, poison-oak, coffeeberry, currant, and ceanothus.

In the southern Cascade and Sierra Nevada ranges, steep, rocky south slopes of major river canyons often are clothed extensively by canyon live oak and scattered old-growth Douglas-fir. Elsewhere, higher elevation overstory associates are typical mixed conifer and California black oak; lower elevation associates are foothill pine, knobcone pine, tanoak, Pacific madrone, and scrubby California-laurel. Associated understory vegetation includes Oregon-grape, currant, wood rose, snowberry, manzanita, poison-oak, and a few forbs and grasses.

Other Classifications-- In southwest Oregon, the species is part of the mixed evergreen (Pseudotsuga-sclerophyll) zone and to a lessor extent the conifer forest zone on drier areas (Franklin and Dryness 1969). These classifications are pertinent to California as well. In California, canyon live oak occurs in 12 of the 17 forest communities described by Munz and Keck (1968)(No Munz and Keck 1968 in Hab Lit Cite.), in 8 dominance types in the Sierra Nevada (Myatt 1980), and in 6 ecological provinces (Parker and Matyas 1980). Cheatham and Haller (1975) place canyon live oak in 8 minor subdivisions of 2 habitat types. Canyon live oak is recognized as a forest cover type by the Society of American Foresters and is an associate species in eight other types (Eyre 1980).

Habitat Stages

Vegetation Changes-- 1;2-5:S-D. Initial establishment of canyon live oak is by acorns, most of which do not move far from beneath tree crowns. Wider dissemination of acorns and seeds of associate species is by birds and mammals. After establishment, canyon live oak sprouts vigorously from the root crown. Most hardwood associates also sprout prolifically. Rapid sprout growth enables the hardwoods to capture most of the favorable micro sites, forcing the conifers to invade harsher sites, or those made harsh by hardwood roots below ground and hardwood shade above. Delayed establishment, slow growth, and sparse or clumpy distribution of conifers often results. In most instances, succession is slow. Seldom is canyon live oak a pioneer species, but occasionally it invades and becomes established on alluvial soils (Heady and Zinke 1978). Canyon live oak has loose, dead, flaky bark that catches fire readily and burns intensely (Plumb 1980). Occasional fire often changes a stand of canyon live oak to live oak chaparral, but without fire for sufficient time, trees again develop. Where fire is frequent, this oak becomes scarce or even drops out of the montane hardwood community.

Duration of Stages-- A type more stable than Montane Hard wood is difficult to envision. The large number of species in the type, both conifer and hardwood, allow it to occupy and persist in a wide range of environments. Good soils and poor, steep slopes and slight, frequently disturbed and pristine all are at least adequate habitats for one or more species. Longevity (at least 300 years for some species), and large size help to ensure dominance. Seed and sprout reproductive modes assure both wide spread and stationary reproduction, and consequently several age and size classes usually are present in most areas. Growth of most hardwoods, especially canyon live oak, generally is slow and depends on depth and rockiness of soil, slope, and possibly length of time for roots to reach groundwater (Myatt 1980)

Biological Setting

Habitat-- At lower elevations, neighboring habitats are Valley foothill Hardwood-conifer (VHC) and, to a lesser extent, Closed cone Pine Cypress (CPC). At low and middle elevations, Mixed Chaparral (MCH) interfaces with Montane Hardwood. Wildlife habitats at middle elevations, often overlapping above and below, are Montane Hardwood-conifer (MHC), Mixed Conifer (MCN), Douglas-fir (DFR) and, to a lesser degree, Pine-juniper (PJN). At higher elevations, Montane Hardwood is neighbor to Eastside Pine (EPN), Jeffrey Pine (JPN), and Montane Chaparral (MCP).

Wildlife Considerations-- Bird and animal species characteristic of the Montane Hardwood habitat include disseminators of acorns (scrub and Steller's jays, acorn woodpecker, and western gray squirrel) plus those that utilize acorns as a major food source wild turkey, mountain quail, band-tailed pigeon, California ground squirrel, dusky-footed woodrat, black bear, and mule deer. Deer also use the foliage of several hardwoods to a moderate extent. Many amphibians and reptiles are found on the forest floor in the Montane Hardwood habitat. Among them are Mount Lyell salamander, ensatina, relictual slender salamander, western fence lizard, and sagebrush lizard. Snakes include rubber boa, ,western rattlesnake, California mountain kingsnake, and sharp tailed snake.

Physical Setting

Canyon live oak and associates are found on a wide range of slopes, especially those that are moderate to steep. Soils are for the most part rocky, alluvial, coarse textured, poorly developed, and well drained. Soil depth classes range from shallow to deep. L Canyon live oak, incense-cedar, and a few other associates are also found on ultrabasic soils. Mean summer temperatures in the Montane Hardwood habitat vary between 20 and 25 C (68 and 77 F) and mean winter temperatures between 3 and 7 C (37 and 45 F). Frost-free days range from 160 to 230 (Thornburgh 1986)(No Thornburgh 1986 in Habitat Lit Cite.). Annual precipitation varies from 2794 mm (110 in) in the northern Coast Range to 914 mm (36 in) in the mountains of southern California.

Distribution

The Montane Hardwood habitat ranges throughout California mostly west of the Cascade-Sierra Nevada crest. East of the crest, it is found in localized areas of Placer, El Dorado, Alpine and San Bernardino Counties. Elevations range from 100 m (300 fl) near the Pacific Ocean to 2745 m (9000 ft) in southern California

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. Manuscript

Eyre, F. H., ed. 1980. Forest cover types of the Unites States and Canada. Soc. Amer. Foresters, Washington D.C.

Franklin, J. F. and C. T. Dyrness. 1969, 1973. Natural vegetation of Oregon and Washington. U.S. Dep. Agric., For. Serv. (Portland, Ore.), Gen.Tech. Rep. PNW-80.

Heady, H. F., and P. J. Zinke. 1978. Vegetational changes in Yosemite Valley. Nat'l. Park Serv. Occas. Pap. 5.

McDonald, P. M., and E. E. Littrell. 1976. The bigcone Douglas-fir canyon live oak community in Southern California. Madroño 23:310-320.

Myatt, R. G. 1980. Canyon live oak vegetation in the Sierra Nevada. Pages 86-91 In T. R. Plumb, tech. ed. Proceedings of the symposium on the ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-44.

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Plumb, T. R. 1980. Response of oaks to fire. Pages 202-215 in T. R. Plumb, tech. ed. Proceedings of the symposium on the ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif), Gen. Tech. Rep. PSW-44.

Montane Riparian

William E. Grenfell Jr.

Vegetation

Structure-- The vegetation of montane riparian (MRI) zones is quite variable and often structurally diverse (Marcot 1979). Usually, the montane riparian zone occurs as a narrow, often dense grove of broad-leaved, winter deciduous trees up to 30 m (98 ft) tall with a sparse understory. At high mountain elevations, MRI is usually less than 15 m (49 ft) high with more shrubs in the understory. At high elevations, MRI may not be well developed or may occur in the shrub stage only.

Composition-- In northwest California along streams west of the Klamath Mountains, black cottonwood is a dominant hardwood. In some areas, it is codominant with bigleaf maple. In either case, black cottonwood can occur in association with dogwood and boxelder. At high elevations black cottonwood occurs with quaking aspen and white alder (Parker and Matyas 1979). In northeastern California, black cottonwood, white alder and thinleaf alder dominate the montane riparian zone. Oregon ash, willow and a high diversity of forbs are common associates. In the Sierra Nevada, characteristic species include thinleaf alder, aspen, black cottonwood, dogwood, wild azalea, willow and water birch (southern Sierra east of the crest), white alder and dogwood (north Sierra). In the southern Coast Range as well as Transverse and Peninsular ranges, bigleaf maple and California bay are typical dominants of montane riparian habitat. Fremont cottonwood is the most important cottonwood in the Sierra below 1524 m (5000 ft), much of the Coast Ranges and the Transverse and Peninsular ranges.

MRI habitats can occur as alder or willow stringers along streams of seeps. In other situations an overstory of Fremont cottonwood, black cottonwood and/or white alder may be present.

Other Classifications-- Montane riparian habitats are also described as riparian (Laudenslayer 1982), riparian deciduous (Verner and Boss 1980, Marcot 1979), bigleaf maple, alder, maple-alder-dogwood, white alder, willow and alder-willow series (Parker and Matyas 1979), mixed riparian woodland -6.21, willow thickets - 6.24 and red alder groves - 6.22 (Cheatham and Haller 1975)
.

Habitat Stages

Vegetation Changes-- 1;2-5:S-D;6. Definite successional stages are not described in the literature. Many montane riparian stages may prevail indefinitely, climax or subclimax. Shrub-type stages should be evaluated as size/age class 1 or 2. Overstory trees such as cottonwood, maple and alder may range up to size/age class 6.

Duration of Stages-- Montane riparian habitats within given watersheds tend to maintain the same mosaic of stages. However, the location of these stages may vary as a result of periodic torrential flows. Riparian Systems can be damaged by debris, sedimentation, or uprooting of entire plants which are redeposited further downstream (Campbell and Green 1968).

Biological Setting

Habitat-- The transition between MRI and adjacent non-riparian vegetation is often abrupt, especially where the topography is steep. This habitat intergrades with montane chaparral, montane hardwood, montane hardwood/conifer, lodgepole pine, red fir and wet meadow habitats.

Wildlife Considerations-- All riparian habitats have an exceptionally high value for many wildlife species (Thomas 1979, Marcot 1979, Sands 1977). Such areas provide water, thermal cover, migration corridors and diverse nesting and feeding opportunities. The shape of many riparian zones, particularly the linear nature of streams, maximizes the development of edge which is so highly productive for wildlife (Thomas 1979).

The range of wildlife that uses the MRI habitat for food, cover and reproduction include amphibians, reptiles, birds and mammals. The southern rubber boa and Sierra Nevada red fox are among the rare, threatened or endangered wildlife that use MRI habitats during their life cycles.

Physical Setting

Riparian areas are found associated with montane lakes, ponds, seeps, bogs and meadows as well as rivers, streams and springs. Water may be permanent or ephemeral (Marcot 1979). The growing season extends from spring until late fall, becoming shorter at higher elevations. Most tree species flower in early spring before leafing out.

Distribution

Montane riparian habitats are found in the Klamath, Coast and Cascade ranges and in the Sierra Nevada south to about Kern and northern Santa Barbara Counties, usually below 2440 m (8000 ft). The Peninsular and transverse ranges of southern California from about southern Santa Barbara to San Diego Counties also include MRI habitat. MRI subtype, consisting mostly of red alder, is found from northern San Luis Obispo to Del Norte Counties along the immediate coast (Cheatham and Haller 1975).

Literature Cited

Campbell, C. J., and W. Green.1968. Perpetual succession of stream-channel vegetation in a semi-arid region. J. Ariz. Acad. Sci. 5(2):86-98.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Laudenslayer, Jr., W. F. (ed.) 1982. Introduction and species-habitat relationships matrix. Vol 1. California wildlife/habitat relationships program: northeast interior zone. U.S. Dep. Agric., For. Serv., Pacific Southwest Region, San Francisco.

Marcot, B. G., ed. 1979. Introduction Vol. I. California wildlife/habitat relationships program north coast/ cascades zone. U.S. Dep. Agric., For. Serv., Six Rivers Nat'l. Forest, Eureka, Calif.

Parker, I., and W. J. Matyas. 1979. CALVEG: A classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group. San Francisco.

Sands, A., ed. 1977. Riparian forests in California, their ecology and conservation. Univ. of California, Davis, Inst. Of Ecol. Publ. No. 15.

Thomas, J. W., tech ed. 1979. Wildlife habitats in managed forests in the Blue Mountains of Oregon and Washington. U.S. Dept. of Agric., For. Serv. Handbook No. 553.

Verner, J., and A. S. Boss tech. coords. 1980. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.

Ponderosa Pine

E. Lee Fitzhugh

Vegetation

Structure-- Tree spacing in ponderosa pine stands varies from open patchy to extremely close. On high quality sites, virgin stands may be 46-55 m (150-180 ft) high, with diameters from 0.91.2 m (3-4 ft) (Harlow and Harrar 1950). Typical overstory coverage of all layers may exceed 100% (Vankat 1970). Other conifers, when present, provide denser crowns than do the pine, thus creating habitat diversity. Grasses, shrubs, and deciduous trees may be present or absent. Typical coverage of shrubs is 10-30% and of grasses and forbs is 5-10% (Barbour 1986).

Composition-- The ponderosa pine habitat includes pure stands of ponderosa pine as well as stands of mixed species in which at least 50% of the canopy area is ponderosa pine. Associated species vary depending on location in the state and site conditions. Typical tree associates include white fir, incense-cedar, Coulter pine, Jeffrey pine, sugar pine, Douglas-fir, bigcone Douglas-fir, canyon live oak, California black oak, Oregon white oak, Pacific madrone and tanoak.

Associated shrubs include manzanita, ceanothus, mountain-misery, Pacific dogwood, hairy yerba-santa, yellowleaf silktassel, bitter cherry, California buckthorn, poison-oak, Sierra gooseberry. Grasses and forbs include slimleaf brome, Orcutt brome, carex, smallflower melicgrass, bluegrass, bottlebrush squirreltail, bedstraw, bracken fern, bush morning-glory, rhomboid clarkia, Child's blue-eyed mary, shrubby eriastrum, splendid gilia, Sierra iris, whisker-brush, Inyo bush lupine, summer lupine, purple nightshade, streptanthus, gooseroot violet, and wild iris.

Other Classifications-- The ponderosa pine habitat, as defined here, forms a part of the yellow pine forest of Munz and Keck (1959) and Thorne (1977), the montane forest of Griffin and Critchfield (1976)(No 1976 Lit Cite. There is a 1972 Lit Cite. 1972 Cite not placed in Lit cite at end.), the ponderosa/Jeffrey pine series of Pays More restrictive types which include only a part of the ponderosa pine habitat are Pacific ponderosa pine (245) (Eyre 1980), ponderosa pine (Parker and Matyas 1979 and Barbour and Major 1977), western Sierra ponderosa pine forest (Barry unpublished, cited in Cheatham and Haller 1975), ponderosa pine series of the Sierra montane conifer forest (Pase 1982a), Coast Range ponderosa pine forest and "westside" ponderosa pine forest (Cheatham and Haller 1975), and Sierran yellow pine forest (Küchler 1977). en, et al. (1980) and the mid-montane conifer forest of Barbour (1986). In addition, on those sites where ponderosa pine is dominant, portions of other montane forests (Küchler

1977), and Pacific ponderosa pine-Douglas-fir (Barbour 1986), and mixed conifer (244, 243), (Eyre 1980) are included in ponderosa pine habitat.

Habitat Stages

Vegetation Changes-- 2-5;SD. Most ponderosa pine stands that include other coniferous trees probably are maintained by periodic ground fires. In many of these stands, crown fires result in dense montane chaparral communities (Cheatham and Haller, 1975). Young, dense stands, as in plantations, exclude most undergrowth once trees attain a closed canopy. Prior to that, dense brush is typical, but an herbaceous layer may develop on some sites.

Duration of Stages-- On sites or areas that are dry or of low quality, significant pine regeneration may depend on concurrent disturbance of chaparral and a good pine seed crop with favorable weather. Thus, it may require 50-100 years for significant pine regeneration in the absence of intervention. Clearcuts with minimal brush control develop a dense stand of pole-size trees in 2030 years, twice the time required when brush is completely removed. Dense brush is typical in young stands and an herbaceous layer may develop on some sites. On drier sites, there is less tendency for succession toward shade-adapted species. Sites disturbed by fire or logging sometimes are converted to dense montane chaparral or mixed chaparral. Moist chaparral areas of higher site quality tend to develop directly into mixed conifer stands. As young, dense stands age and attain a closed canopy, they exclude most undergrowth. When other adapted conifers occur in moist ponderosa pine stands of medium to high site quality, they may form a significant understory in about 20 years in the absence of fire. If allowed to continue, such succession may change the structure and composition of the stand within 40 years sufficiently to favor wildlife adapted to mixed conifer habitats. Most ponderosa pine stands that include other coniferous trees probably are maintained by periodic ground fires (Cheatham and Haller 1975).

Biological Setting

Habitat-- In Northern California, ponderosa pine stands occur above coastal oak woodland, valley oak woodland, blue oak woodland, blue oak-foothill pine and below mixed conifer. Montane hardwood stands may be below or interspersed with ponderosa pine. Jeffrey pine stands often occur above ponderosa pine, but may be found on serpentine soils or on harsh sites at lower elevations in the ponderosa pine zone. Farther south, coastal scrub, chamise-redshank, mixed chaparral, or woodland oaks are typical at the lower boundary of the ponderosa pine habitat, with bigcone Douglas-fir or true firs at the upper edge. Dry, rocky sites within the habitat may support montane chaparral, mixed hard wood-conifer or closed-cone pine-cypress. Isolated, small patches of bigcone Douglas-fir may occur in mesic canyons or on north-facing slopes within ponderosa pine stands.

Wildlife Considerations-- Ponderosa pine sometimes is a transitional or migratory habitat for deer and can be extremely important to deer nutrition in migration holding areas. A mixture of early and late successional stages closely interspersed probably will provide good general wildlife habitat but riparian zones, deer migratory routes and holding areas require special consideration during management planning. The California condor uses the ponderosa pine habitat from Madera and Santa Clara Counties southward. Moreover, the Sierra Nevada red fox, Siskiyou mountain salamander and Shasta salamander also are found in the habitat.

Physical Setting

The lower elevational limit of the habitat may correspond to a mean annual temperature less than 13 C (55 F) and precipitation greater than 350 mm (33 in) except in southern California (Barbour 1986). Brown (1982) reported a minimum precipitation level of 635 mm (25 in) annually in the Peninsular Ranges. Ponderosa pine is found on all aspects, depending on soils and location within the local elevational range. Less than one-third of the precipitation is snowfall (Barbour 1986).

Distribution

Ponderosa pine habitat is found on suitable mountain and foothill sites throughout California except in the immediate area of San Francisco Bay, in the north coast area, south of Kern County in the Sierra Nevada and east of the Sierra Nevada Crest. Elevational ranges include 240-180 m (800-5000 ft) in the northern Sierra Nevada and Cascades, 1200-2100 m (3937-6890 ft) in the central and southern Sierra Nevada and 1300-2140 m (4265-7021 ft) in the Transverse and Peninsular Ranges, although it may be found as low as 105 m (3445 ft) in moist south-coastal sites (Rundel et al. 1977, Thorne 1977, Brown 1982 and Cheatham and l Haller 1975). The ponderosa pine habitat is replaced by Jeffrey pine on the Mojave Desert slopes of the Transverse Range and often on the eastern side of the Peninsular and Coast Ranges.

Literature Cited

Barbour, M. G. 1986. Upland forests and woodlands of California and Baja California. Chapter 5 In M. G. Barbour and W. D. Billings, eds. Terrestrial vegetation of North America. Cambridge Univ. Press, Cambridge.

Barbour, M. G., and J. Major eds. 1977. Terrestrial vegetation of California. John Wiley and Sons, New York.

Brown, D. E., ed.1982. Biotic communities of the American Southwest – United States and Mexico. Desert Plants 4.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Eyre, F. H., ed. 1980. Forest cover types of the Unites States and Canada. Soc. Amer. Foresters, Washington D.C.

Harlow, W. M., and E. S. Harrar. 1950. Textbook of dendrology, McGraw-Hill, New York.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1979. CALVEG: A classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group. San Francisco.

Pase C. P. 1982a. Sierran montane conifer forest. Pages 49-51 In D. E. Brown, ed. Biotic communities of the American Southwest-United States and Mexico. Desert Plants 4.

Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.

Rundel, P. W., D. T. Gordon, and D. J. Parsons. 1977. Montane and subalpine vegetation of the Sierra Nevada and Cascade Ranges. Pages 559-599 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Thorne, R.F. 1977. Montane and subalpine forests of the Transverse and Peninsular Ranges. Pages 537-557 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

VanKat, J. L. 1970. Vegetation change in Sequoia National Park, California. Ph.D. dissertation, Univ. of California, Davis.

Valley Oak Woodland

Lyman V. Ritter

Vegetation

Structure-- This habitat varies from savanna-like to forest-like stands with partially closed canopies, comprised mostly of winter-deciduous, broad-leaved species. Denser stands typically grow in valley soils along natural drainages. Tree density decreases with the transition from lowlands to the less fertile soils of drier uplands. Exceptions to this pattern are known, especially in the central coastal counties (N. H. Pillsbury, pers. comm.). Similarly, the shrub layer is best developed along natural drainages, becoming insignificant in the uplands with more open stands of oaks. Valley oak stands with little or no grazing tend to develop a partial shrub layer of bird-disseminated species, such as poison-oak, toyon, and coffeeberry (J. R. Griffin, pers. comm.). Ground cover consists of a well-developed carpet of annual grasses and forbs. Mature valley oaks with weil-developed crowns range in height from 15 to 35 m (49 to 115 ft) (Cheatham and Haller 1975, Conard et al. 1977).

Composition-- Canopies of these woodlands are dominated almost exclusively by valley oaks (Conard et al. 1977). Tree associates in the Central Valley include California sycamore, Hinds black walnut, interior live oak, boxelder, and blue oak. The shrub understory consists of poison-oak, blue elder, California wild grape, toyon, California coffeeberry, and California blackberry. Various sorts of wild oats, brome, barley, ryegrass, and needlegrass dominate the ground cover. Foothill pine and coast live oak are associated with VOWs along the Coast Range (Parker and Matyas 1979). Griffin (1976) reported that Coulter pine and canyon live oak are found in a montane Savannah of valley oak in the Santa Lucia Range, Monterey County.

Other Classifications-- This type is referred to as the Foothill Woodland by Munz and Keck (1959), Valley Oak Savanna (33) by Küchler (1977), the Valley Oak Phase of the Foothill Woodland by Griffin (1977), Valley Oak Series by Paysen et al. (1980), and Valley Oak Community by Parker and Matyas (1979). Conard et al. (1977) and others include VOWs in the Central Valley riparian zone, a vegetative division in the physiographic gradient extending from river edges to higher terraces. Cheatham and Haller (1975) included part of the VOW habitat in their Central Valley Bottomland Woodland (6.11), and Küchler (1977) included parts in his Riparian Forest (28) designation.

Habitat Stages

Vegetation Change-- 1;2-5:S-D. In most remaining VOW, little recruitment of young oaks occurs to replace the veteran oaks dying of natural causes or being destroyed by urban and agricultural development (White 1966, Griffin 1973, 1976, 1977). The lack of oak recruitment seems to be related to animal damage of acorns and seedlings (Griffin 1980a, b). The successful combination of circumstances for valley oak establishment is speculative. The future of this habitat in valley locations seems to be fewer valley oaks and more open grassland (Griffin 1976). However, Griffin (1976) found that the current absence of ground fire encourages the invasion of evergreen oaks, Coulter pine, or both, in upland sites in the Santa Lucia Mountains. Presently, most valley oak stands are in mature stages 5:S-D, but structural classes 1-5:S-D are presumably possible. Canopy development and plant density are variable. Only a few localized studies give quantitative data on the structure of VOW (see Griffin 1976, Conard et al. 1977).

Duration of Stages-- Secondary succession of VOWs under natural conditions has not been studied and little opportunity exists for its study. Most surviving stands appear to be between 100 and 300 years old, and individual valley oaks may live as long as 400 years (Stern 1977). Valley oaks seem to be tolerant of flooding (Harris et al. 1980), and young trees will sprout when fire damaged (Griffin 1976). Given natural perturbations such as fire and flooding, and assuming successful regeneration of valley oaks, VOW would probably remain the climax community.

Biological Setting

Habitat-- VOWs in the Great Valley usually merge with Annual Grasslands or border agricultural land. Where these woodlands extend to the foothills surrounding the valley, they intergrade with Blue Oak Woodlands or Blue Oak-Foothill Pine habitats. Near major stream courses this community intergrades with Valley-Foothill Riparian vegetation. West of the Coast Range, VOWs sometimes associate with Coastal Oak Woodlands and, to a limited extent, Montane Hardwood and Coastal Scrub.

Wildlife Considerations-- These woodlands provide food and cover for many species of wildlife. Oaks have long been considered important to some birds and mammals as a food resource (i.e., acorns and browse). Verner (1980a) reported that 30 bird species known to use oak habitats in California include acorns in their diet. An average of 24 species of breeding birds were recorded on a study plot at Ancil Hoffman Park, near Carmichael, in Sacramento County from 1971 to 1973 (Gaines 1977). The study plot was dominated by valley oaks but included some cottonwood in the canopy. Probably the most significant breeding bird species recorded was red-shouldered hawk. In decreasing order, the most common species were European starling, California quail, plain titmouse, scrub jay, rufous-sided towhee, Bewick's wren, bushtit, and acorn woodpecker. Barrett (1980) indicates that the ranges of about 80 species of mammals in California show substantial overlap with the distribution of valley oaks, and several, such as fox and western gray squirrels and mule deer, have been documented using valley oaks for food and shelter.

Physical Setting

This habitat occurs in a wide range of physiographic settings but is best developed on deep, well-drained alluvial soils, usually in valley bottoms. Most large, healthy valley oaks are probably rooted down to permanent water supplies (Griffin 1973). Stands of valley oaks are found in deep sills on broad ridge-tops in the southern Coast Range. Where this type occurs near the coast, it is usually found away from the main fog zone (Griffin 1976). The climate is Mediterranean, with mild, wet winters and hot, dry summers.

Distribution

Remnant patches of this habitat are found in the Sacramento Valley from Redding south, in the San Joaquin Valley to the Sierra Nevada foothills, in the Tehachapi Mountains, and in valleys of the Coast Range from Lake County to western Los Angeles County. Usually it occurs below 610 m (2000 ft), although Griffin (1976) reported a ridge-top stand at 1525 m (5000 ft) in the Santa Lucia Mountains.

Literature Cited

Barrett, R. H. 1980. Mammals of California oak habitats: management implications. Pages 275-291 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Conard, S., R. McDonald, and R. Holland. 1977. Riparian vegetation and flora of the Sacramento Valley. Pages 47-55 In A. Sands, ed. Riparian forests in California: their ecology and conservation. Univ. of California, Davis, Inst. of Ecol. Publ. No. 15.

Gaines, D. A. 1977. The valley riparian forests of California: their importance to bird populations. Pages 57-85 In A. Sands, ed. Riparian forests in California: their ecology and conservation. Univ. of California, Davis, Inst. of Ecol., Publ. No. 15.

Griffin, J. R. 1973. Xylem sap tension in three woodland oaks of central California. Ecology 54:152-159.

Griffin, J. R. 1976. Regeneration in Quercus lobata savannas, Santa Lucia Mountains, California. Amer. Midl. Nat. 95:422-435.

Griffin, J. R. 1977. Oak woodland. Pages 383-415 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

Griffin, J. R. 1980a. Animal damage to valley oak acorns and seedlings, Carmel Valley, California. Pages 242-245 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Griffin, J. R.1980b. Sprouting in fire-damaged valley oaks, Chews Ridge, California. Pages 216-219 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Harris, R. W., A. T. Leiser, and R. E. Fissell. 1980. Tolerance of oaks to flooding. Pages 238-241 In T. R. Plumb tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-44.

Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, Terrestrial vegetation of California. John Wiley and Sons, New York.

Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.

Parker, I., and W. J. Matyas. 1979. CALVEG: A classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group. San Francisco.

Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45. Stern, K. R. 1977. The passing of the Hooker oak. Fremontia 512-13.

Verner, J. 1980a. Birds of California oak habitats: management implications. Pages 246-264 In T. R. Plumb, tech. coord. Ecology, management, and utilization of California oaks. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.) Gen. Tech. Rep. PSW-44.

White, K. L. 1966. Structure and composition of foothill woodland in central coastal California. Ecology 47:229-237.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Redwood

Kenneth E. Mayer

Vegetation

Structure-- Second growth redwood habitats are characterized by even-aged structure with an open parklike appearance. Typically, on disturbed sites the vegetation established very quickly (within one year). In time, the habitat is composed of dense (>60% crown closure), shrubby <10 m (32 ft) vegetation with overlapping canopies (Jepson 1910, Roy 1966a, Becking 1968, Stone and Vasey 1968, Stone, et al. 1972, Zinke 1977, Veirs 1983(No 1983 Habitat Lit Cite. There is a 1981 Cite. Not placed in Bib.). Over time, trees become uniform in size and height, suppressing understory vegetation. Virgin old growth stages of this habitat also exist. Such stands are characterized by tall 70 to < 120 m (230 to <400 ft) dominant and codominant trees. Wood volume in these stands may reach a basal area of 100-150 m2/ha (450-650 H 2/ac) (Becking 1968, Veirs 1983). Understory vegetation in old-growth redwood is usually very dense (> 60% crown closure) and composed of 3 to 4 m (10 to 13 ft) tall shrubs. Open parklike old-growth stands seldom occur except on alluvial flats or on lower slope mesic sites (D. Thornburgh, pers. comm.). Redwoods are very vigorous sprouters with sprouts eventually forming the dominant canopy. Redwood and associated conifers also reproduce well by seed. When suppressed by the dominant canopy, seedling heights are usually <10 m (33 ft) (Person and Hallin 1942, Muelder and Hansen 1961, Becking 1968).

Composition-- The redwood habitat is a composite name for a variety or mix of conifer species that grow within the coastal influence zone <50 km (31 mi) from the coast. In the north coast region of California (within 4 km (2.5 mi) of the coast), the Redwood habitat (RDW) consists of Sitka spruce, grand fir, redwood, red alder, and Douglas-fir. Western redcedar and western hemlock are also associates but seldom comprise the major portion of a stand. Redwood becomes dominant along coastal areas approximately 4 to 16 km (2 to 10 mi) from the ocean where Douglas-fir, red alder, and grand fir are its major associates. Further inland, Douglas-fir becomes dominant with tan oak and madrone as the major associates (Becking 1968, Zinke 1977).

The southern extension of the RDW is similar in physiognomy but varies in species composition. Redwood is dominant along the coast, with Douglas-fir as its common associate; tan oak and madrone are also major constituents of the habitat. Other contributing tree species are Bishop pine, Monterey pine, sugar pine, Jeffrey pine, Port-Orford cedar, California bay, Oregon ash, and big-leaf maple. These species are present in response to soil or microclimate conditions.

Understory composition is diverse and varies along a north-south/east-west gradient. Important species are sword fern, deer fern, chainfern, Andrew beadlily, barberry salal, coast rhododendron, California huckleberry, California red huckleberry, coast fireweed creambush oceanspray, salmonberry, poison-oak, western thimbleberry, cascara buckthorn, coyotebush, Scotchbroom, blueblossom ceanothus, snowbrush ceanothus, Idaho fescue, and western fescue.

Other Classifications-- Due to its uniqueness, the redwood type is considered as a uniform type by numerous sources. Other names include Redwood Forest (Cheatham and Haller 1975), Redwood (Eyre 1980), Redwood Zone – Early Seral Shrub, Redwood Zone - Second Growth Forest, Redwood Zone - Old Growth Forest (Proctor et al. 1980), Redwood-Douglas-fir, Redwood (Parker and Matyas 1981).

Habitat Stages

Vegetation Changes-- 1;2-5:S-D,f The climax stage of the redwood habitat is distinguished by a bilayered canopy, usually with redwood or Douglas-fir as the dominant species. Redwood is a self-perpetuating habitat, with or without fire as a disturbance. After disturbance (usually logging, fire, or flooding) succession proceeds rapidly. Initially, disturbed sites are barren with a sparse herb layer. This stage usually gives way to shrubs and redwood sprouts within 10 years. Regeneration of redwoods (seedling or sprouts) is most successful on disturbed sites (Person and Hallin 1942, Muelder and Hansen 1961, Florence 1965). Over time, conifers become more dominant, with resilient shrub types comprising the understory. In drier locations, mid-seral stages are composed of hardwoods which are usually dominant or codominant to the conifers. This mix of conifer and hardwood persists for many years, but eventually gives way to conifer dominance. Fire and flooding in the redwood ecosystem play a major role in terms of reproduction and plant succession. When fire is introduced, various plant species are affected, ultimately altering the habitat stage.

Duration of Stages-- The rate of change from one habitat stage to the next is dependent on site location and quality. Latitude and distance from the ocean also play a major role. Approximate successional time frames for the Redwood habitat are:

Stage	Years
Seedling	<5
Sapling	5-30
Pole	30-60
Small	60-100
Medium/Large	100-150
Multilayered	150-2,000

Biological Setting

Habitat-- Redwood habitats occur in relatively mesic environments along the north and central coasts of California. In the north, the habitat intermingles with the Douglas-fir (DFR) and Klamath-Enriched Mixed Conifer (KMC) habitats. In the southern extent of its range, the Coastal Oak Woodland (COW) habitat is its primary associate. Throughout the range of the redwood habitat, annual/perennial grassland habitats (AGS/PGS) are intermingled as glades and prairies.

Wildlife Considerations-- Redwood habitats provide food, cover, or special habitat elements (for at least one season) for 193 wildlife species (Marcot 1979). This total is comprised of 12 reptiles, 18 amphibians, 109 birds, and 54 mammals. Of these species, 18 are considered harvest species. Moreover, a variety of sensitive species are found in the habitat. Species such as the red-legged frog, ensatina, osprey, ringtail, fisher and marbled murrelet show a relatively high preference for various redwood habitat phases and stages. To a minor extent, sensitive species such as the peregrine falcon, pileated woodpecker, spotted owl, and northern flying squirrel can be found, but are usually vagrants in the habitat. The endangered bald eagle can also be found in the habitat (considering the special habitat element), but is usually not a common visitor.

Physical Setting

Redwood habitats are restricted to coastal areas where temperature regimes are relatively stable. Summer coastal fog and marine air flows inland have a great influence on the habitat. Temperatures in the redwood regions range from summer highs of about 40 C (100 F) to winter lows of about 8.8 C (16 F). Ambient temperatures increase on an inland progression, as elevation increases and marine air flow decreases. Precipitation occurs mostly during winter months, with an annual average of 101 cm (40 in). Precipitation (mostly rain) in excess of 230 cm (90 in) occurs in isolated coastal areas. All variations of topography exist, from gradual elevational changes to steep, abrupt mountain ranges, common in the central north coast. Elevations where the habitat can be found range from sea level to over 915 m (3000 ft) in Monterey County (Becking 1968). Soils are composed of relatively young, deep, fertile alluvial and colluvial parent material. Moreover, sites also exist within the region that have a high acid content. Serpentine soils are also present, which create an open prairie condition and may support relic conifer types.

Distribution

Redwood habitats are distributed along the coast of California ranging from the California-Oregon border to San Luis Obispo County. The habitat can be found in various vegetative phases to approximately 50 km (31 mi) inland from the coast.

Literature Cited

Becking, R. W. 1968. The ecology of the coast redwood forest. Final Rep., Nat'l. Sci. Found. Grant 4690.

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Eyre, F. H., ed. 1980. Forest cover types of the Unites States and Canada. Soc. Amer. Foresters, Washington D.C.

Florence, R. G. 1965. Decline of old-growth redwood forests in relation to some soil microbiological processes. Ecology 46:52-64.

Jepson, W. L. 1910. The silva of California. Vol. 2. Univ. of California Mem. Muelder, D. W., and J. H. Hansen. 1961. Biotic factors in natural regeneration of Sequoia sempervirens. Inter. Union Forest Research Orgs., 13th Congress, Vienna. Proc. Pt. 2 Vol. 1 (21-4/1).

Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.

Person, H. L, and W. Hallin. 1942. Natural restocking of redwood cutover lands. J. Forestry 40:683-688.

Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.

Roy, D. F. 1966a. Silvical characteristics of redwood. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Res. Pap. PSW-28.

Stone, E. C., and R. B. Vasey. 1968. Preservation of coast redwood on alluvial flats. Science 159:157-161.

Stone, E. C., R. Grah, and P. Zinke. 1972. Preservation of the primeval redwoods in the Redwood National Park. Parts I and 11. Amer. For. 78(4):50-55, and 78(5):48-56.

Veirs, S. D. 1981. Coast redwood forest stand dynamics, succession status, and the role of fire. Pages 119-141 In J. E. Means ed. Proc. Forest succession and stand development in the northwest. Oregon State Univ., Corvallis.

Zinke, P. J. 1977. The redwood forest and associated north coast forest. Pages 679-698 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Riverine

William E. Grenfell Jr.

General Description

Structure-- Intermittent or continually running water distinguishes rivers and streams. A stream originates at some elevated source, such as a spring or lake, and flows downward at a rate relative to slope or gradient and the volume of surface runoff or discharge. Velocity generally declines at progressively lower altitudes, and the volume of water increases until the enlarged stream finally becomes sluggish. Over this transition from a rapid, surging stream to a slow, sluggish river, water temperature and turbidity will tend to increase, dissolved oxygen will decrease and the bottom will change from rocky to muddy (McNaughton and Wolf 1973).

Aquatic Environment

Composition-- The majority of fast stream inhabitants live in riffles, on the underside of rubble and gravel, sheltered from the current. Characteristic of the riffle insects are the nymphs of mayflies, caddisflies, alderflies, stoneflies; and the larva and pupae of true flies. In pools, the dominant insects are burrowing mayfly nymphs, dragonflies, damselflies and water striders. Water moss and heavily branched filamentous algae are held to rocks by strong holdfasts and align with the current. Other algae grow in spheric, or cushionlike colonies with smooth, gelatinous surfaces. Algae growth in streams often exhibits zonation on rocks, which is influenced by depth and current.

With increasing temperatures, decreasing velocities and accumulating bottom sediment, organisms of the fast water are replaced by organisms adapted to slower moving water. Mollusks and crustaceans replace the rubble-dwelling insect larvae. Backswimmers, water boatmen and diving beetles inhabit sluggish stretches and backwaters. Emergent vegetation grows along river banks, and duckweed floats on the surface. Abundant decaying matter on the river bottom promotes the growth of plankton populations that are not usually found in fast water.

Other Classifications-- Other classification systems of rivers and streams are: Riverine (Cowardin et al. 1979); Streams-10.2, Rivers-10.3 (Cheatham and Haller 1975) and Proctor et al. (1980).

Aquatic Zones and Substrates

The riverine habitat exists in structural classes 1;24:0-B. Open water (1) is defined as greater than 2 meters in depth and/or beyond the depth of floating rooted plants, and does not involve substrate. Small rivers and streams may not have an open water zone. The submerged zone (2) is between open water and shore. The shore (4) is seldom flooded (except for wave wash or fluctuations in flow) and is less than 10 percent canopy cover. For shorelines with 10 percent canopy cover or more, use a terrestrial habitat designation.

The rate at which a stream erodes its channel is determined by the nature of the substrate, composition of the water, climate and the gradient. The greater the slope, the greater the capacity to transport abrasive materials through increased velocity (Reid 196)

Most natural riverine systems are relatively stable over long periods of time as long as there is no human interference. The building of dams and the dredging and straightening of stream channels are in the most important factors controlling the duration of stream and river types.

Biological Setting

Habitat-- Riverine habitats can occur in association with many terrestrial habitats. Riparian habitats are found adjacent to many rivers and streams. Riverine habitats are also found contiguous to lacustrine and fresh emergent wetland habitats.

Wildlife Considerations-- The open water zones of large rivers provide resting and escape cover for many species of waterfowl. Gulls, terns, osprey and bald eagle hunt in open water. Near-shore waters provide food for waterfowl, herons, shorebirds, belted-kingfisher and American dipper. Many species of insectivorous birds (swallows, swifts, flycatchers) hawk their prey over water. Some of the more common mammals found in riverine habitats include river otter, mink, muskrat and beaver.

Physical Setting

Streams begin as outlets of ponds or lakes (lacustrine), or rise from spring or seepage areas. All streams at some time experience very low flow and nearly dry up. Some streams, except for occasional pools, dry up seasonally every year.

The temperature of the riverine habitat is not constant. In general, small, shallow streams tend to follow, but lag behind air temperatures, warming and cooling with the seasons. Rivers and streams with large areas exposed to direct sunlight are warmer than those shaded by trees, shrubs and high, steep banks.

The constant swirling and churning of high-velocity water over riffles and falls result in greater contact with the atmosphere-and thus have a high oxygen content. In polluted waters, deep holes or low velocity flows, dissolved oxygen is lower (Smith 1974).

Distribution

Rivers and streams occur statewide, mostly between sea level and 2438 meters (8000 fl).

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Cowardin, L. M. V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/31.

McNaughton, S. J., and L. L. Wolf. 1973. General ecology. Holt, Rinehart, and Winston Inc., San Francisco.

Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.

Reid, G. K. 1966. Ecology of inland waters and estuaries. Reinhold Publishing Corp., New York.

Smith, R. L. 1974. Ecology and field biology. Harper and Row, New York.

Lacustrine

William E. Grenfell Jr.

General Description

Structure-- Lacustrine habitats are inland depressions or dammed riverine channels containing standing water (Cowardin 1979). They may vary from small ponds less than one hectare to large areas covering several square kilometers. Depth can vary from a few centimeters to hundreds of meters. Typical lacustrine habitats include permanently flooded lakes and reservoirs (e.g., Lake Tahoe and Shasta Lake), intermittent lakes (e.g., playa lakes) and ponds (including vernal pools) so shallow that rooted plants can grow over the bottom. Most permanent lacustrine systems support fish life; intermittent types usually do not.

Aquatic Environment

Suspended organisms such as plankton are found in the open water of lacustrine habitats. Dominant are the phytoplankton, including diatoms, desmids and filamentous green algae. Because these tiny plants alone carry on photosynthesis in open water, they are the base upon which the rest of limnetic life depends. Suspended with the phytoplankton are animal or zooplankton organisms which graze upon the minute plants. Most characteristic are rotifers, copepods and cladocerans (Smith 1974).

The plants and animals found in the littoral zone vary with water depth, and a distant zonation of life exists from deeper water to shore. A blanket of duckweed may cover the surface of shallow water. Desmids and diatoms, protozoans and minute crustaceans, hyrdras and snails live on the under-surface of the blanket; mosquitoes and collembolans live on top. Submerged plants such as algae and pondweeds serve as supports for smaller algae and as cover for swarms of minute aquatic animals. As sedimentation and accumulation of organic matter increases toward the shore, floating rooted aquatics such as water lillies and smartweeds often appear. Floating plants offer food and support for numerous herbiverous animals that feed both on phytoplankton and the floating plants (Smith 1974).

Other Classifications-- Other names of lacustrine habitats include Lacustrine (Cowardin et al. 1979), Lakes - 10.41, Manmade Reservoirs - 10.42 and Ponds -10.43 (Cheatham and Haller 1975). The U.S. Fish and Wildlife Service summarizes several lacustrine habitats according to their occurrence in certain terrestrial habitats (Proctor et at. 1980).

Aquatic Zones and Substrates

The lacustrine habitat may exist in any of the structural classes 1:2 4:O~B. The limnetic or open water zone extends from the deepest part to the depth of effective light penetration. The submerged (littoral) zone is shallow enough to permit light penetration and occurs at the edges of lakes and throughout most ponds. Periodically flooded lacustrine habitats should be evaluated only when water is present. This stage usually cannot support fish populations, and therefore will not attract fish predators. To qualify as shoreline, there must be a water border and less than 2 percent vegetation. Shoreline vegetation exceeding 2 percent would fall into the riparian category.

Lakes and ponds are more or less temporary features of the landscape because of a slow siltation process. The time it takes depends on size, rate of sedimentation and the increase of organic matter.

Biological Setting

Habitat-- Lacustrine habitats may occur in association with any terrestrial habitats, Riverine (RIV) and Fresh Emergent Wetlands (FEW).

Wildlife Considerations-- Lacustrine habitats are used by 18 mammals, 101 birds, 9 reptiles and 22 amphibians for reproduction, food, water and cover. This represents about 23 percent of the species in the Wildlife Habitat Relationships data base. The endangered Santa Cruz long-toed salamander and rare black toad require ponds for breeding. The endangered bald eagle feeds on fish and some birds taken from lakes.

Physical Setting

The relatively calm waters of lakes and ponds offer environmental conditions that contrast sharply with those of running water. Light penetration is dependent on turbidity. Temperatures vary seasonally and with depth. Because only a small proportion of the water is in direct contact with the air and because decomposition is taking place on the bottom, the oxygen content of lake water is relatively low compared to that of running water. In some lakes, oxygen may decrease with depth, but there are many exceptions. These gradations of oxygen, light and temperature along with the currents and seiches, profoundly influence the vertical distribution of lake organisms (Smith 1974).

Distribution

Lacustrine habitats are found throughout California at virtually all elevations, but are less abundant in arid regions.

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Cowardin, L. M. V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/31.

Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.

Smith, R. L. 1974. Ecology and field biology. Harper and Row, New York.

Marine

David C. Zeiner

General Description

Structure-- Marine habitats extend from the upper limit of the unvegetated shore to the ocean, including the 12-mile contiguous zone. Four zones are included in this habitat. The pelagic zone is characterized by open water with depths greater than required for growth of canopy-forming kelps and extending offshore to include the 12-mile contiguous zone. The subtidal zone extends seaward from the low-low tide line to and including the depth that supports canopy forming kelps given the proper substrate. The intertidal zone includes the area exposed by lowest-low tide up to and including the spray zone. Finally, the shore zone consists of any barren land between the spray zone to where terrestrial vegetation exceeds 10 percent canopy closure and may vary in width from a few feet to several hundred meters.

Aquatic Environment

Vegetation in the pelagic zone is limited to phytoplankton (diatoms and microalgae) and is produced in the euphotic zone (depth of light penetration). Phytoplankton together with the animal component, zooplankton, are the primary food source for filter-feeding organisms such as anchovies and many invertebrates which are eaten directly by marine birds and mammals or are forage for fish and invertebrates consumed by marine birds and mammals. In the subtidal zone in addition to phytoplankton, canopy forming macroalgaes and other forms of macroalgaes occur, if suitable substrates are available for them in depths to approximately 36.6 meters (120 feet) in southern California. North of San Francisco, canopy-forming kelps such as bull kelp are generally restricted to water depths less than 12 meters (40 feet) and most are annual species except in a few protected areas. Also in the subtidal zone are a large number of short kelps, coraline algaes and other algae. One species of flowering plant, surf grass, is found in the marine habitat. Surfgrass occurs in subtidal and intertidal zones. Macroalgaes, which provide cover for sea otters and a large variety of fish, are eaten by a few fish and several invertebrates and are a major source of organic detritus for filter feeders (Ricketts and Calvin 1968). Within the subtidal and intertidal zones, sessile forms of flora and fauna are distributed according to exposure to wave action, water depth, type of substrate, water temperature and latitude.

Other Classifications-- Similar classifications of marine habitats include Marine System (Cowardin et al. 1979); Exposed Open Coast -1.3 and Protected Open Coast -1.4

(Cheatham and Haller 1975); Beach Surf Zone - 22.1, Headlands and Rocky Islands - 2.3 and Oceanic Zones - 3.0 (Proctor et al. 1980).

Aquatic Zones and Substrates

The marine habitat exists in structural classes 1,2-4:O-B. Manmade changes in marine habitat zones are usually permanent and are caused by dredging and filling in the intertidal zone and construction in the shore zone. Vegetation changes in marine habitats are attributed to pollution (turbidity), warm water from power generating facilities or current changes, high surf condition, and major increases or decreases in herbivore populations such as the expansion of sea urchin populations, which may be related to pollution, or the depletion of herbivores resulting from sea otter foraging. Re-establishment can be rapid as in the case of plankton or slow and requiring human intervention, as in the re-establishment of kelp in sea urchin dominated areas. Re-establishment is an annual event for some species of macroalgae such as sea palm and bull kelp. Vegetation changes may alter the value of the habitat zones to wildlife but do not change the WHR classifications. Substrates are also generally stable in the marine environment except when modified by human intervention such as dredging, filling, construction of artificial reefs, breakwaters, and jetties which, in addition to their physical presence, may affect sand transport. Substrates occurring in marine habitat include mud, sand, gravel/cobble, rubble/boulders, and bedrock. Marine habitats are permanent unless eliminated by human actions.

Biological Setting

Habitat-- The shore zone of the marine habitat may occur in association with Estuarine (EST) habitats where freshwater is discharged into the ocean through river systems. Also along the length of the State, several types of terrestrial habitat are associated with the shore zone including Annual Grassland and Perennial Grassland (PGS), Coastal Scrub (CSC), Valley Foothill Riparian (VRI), and Montane Riparian (MRI), Redwood (RDW), Douglas-fir (DFR), Cropland (CRP), and Residential Park (RSP).

Wildlife Considerations-- Marine habitats are used almost exclusively by seven species of marine mammals, and 31 pelagic birds. They receive extensive use by shore and wading birds, gulls, terns, sea ducks, and ospreys. Other species that use marine habitats in varying amounts are island foxes, river otters, raccoons, and common ravens. The endangered bald eagle feeds on fish taken from the Marine habitats.

Physical Setting

Water depths in the Marine habitat range from 0 to over 1,000 fathoms. Salinities exceed 30 ppt. with little or no dilution except near the mouths of estuaries (Cowardin 1979) or near submarine sewage discharges. Water temperatures vary with seasonal currents, but generally increase from north to south and will range between a low of 6 C (43 F) and a high of 21.5 C (71 F). Wind and wave action generally increase from south to north, with periods of highest activity associated with winter storms.

A phenomenon called upwelling is caused by onshore winds and brings cold, nutrient-rich water from ocean depths to replace nearshore surface water which has been driven offshore by the wind. This phenomenon is responsible for sustaining much of the extensive assemblage of flora and fauna that occur in California nearshore ocean waters.

Distribution

Marine habitats are found along the entire length of the California coast from Oregon to Mexico.

Literature Cited

Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript

Cowardin, L. M. V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/31.

Proctor, C. M., J. C. Garcia, D. V. Galvin, G. B. Lewis, and L. C. Loehr. 1980. An ecological characterization of the Pacific Northwest Coastal Region. U.S. Dep. Interior, Fish and Wildl. Serv. FWS/OBS - 79/11 through 79/15.

Ricketts, E. F., J. Calvin, and J. W. Hedgpeth. 1968. Between Pacific tides. 4th ed. Stanford Univ. Press, Stanford, Calif.

Cropland

David C. Zeiner

Vegetation

Structure—Vegetation in this habitat includes a variety of sizes, shapes, and growing patterns. Field corn can reach ten feet while strawberries are only a few inches high. Although most crops are planted in rows, alfalfa hay and small grains (rice, barley, and wheat) form dense stands with up to 100 percent canopy closure. Most croplands support annuals, planted in spring and harvested during summer or fall. In many areas, second crops are commonly planted after harvesting the first. Wheat is planted in fall and harvested in late spring or early summer. Overwintering of sugar beets occurs in the Sacramento Valley, with harvesting in spring after the soil dries.

Composition—The 1982 crop report (California Department of Food and Agriculture 1983) recognized 200 crops in California that include 25 classified as orchard or vineyard for Wildlife Habitat Relationships (WHR) purposes. Cropland vegetation is grown as a monoculture, using tillage or herbicides to eliminate unwanted vegetation.

Other Classifications—Most vegetation classification systems include cropland in more general categories, such as Agriculture (California Department of Fish and Game 1966) or Urban/Agriculture (Parker and Matyas 1981).

Habitat Stages

Vegetation Changes—Cropland habitats do not conform to normal habitat stages. Instead, cropland is regulated by the crop cycle in California. These habitats can either be annual or perennial, vary according to location in the state, and germinate at various times of the year. Crops such as milo, cotton, rice and lettuce are common annual plants, whereas alfalfa, asparagus, artichokes and strawberries are perennials. In addition, the crop rotation system is used extensively. The system rotates crop types (usually between annual and perennials) to conserve soil nutrients, thus maintaining soil productivity.

Duration of Stages—Most cropland types in California are annuals and are managed in a crop rotation system. Generally, the crop rotation system employs a combination of annual and perennial crops on a 5-7 year rotation. For example in the San Joaquin Valley, cotton will be planted and maintained for 3 years, following by 3 years of alfalfa and 1 year of grain. In Imperial and Ventura Counties crops are cultivated year-round. Double and triple cropping is a common practice in some areas. After the first crop is harvested, a second and sometimes a third crop is planted and harvested depending on species and climate. For example, in Ventura County on the Oxnard plain, cool weather crops such as lettuce and cabbage are grown in the fall and winter followed by tomatoes, corn, and peppers in the spring and summer. Planting time frames vary as well with the majority of cropland habitats being planted in spring and harvested late summer and early fall. However, exceptions do exist (e.g. sugar beets) where crops are planted in the summer and harvested the following spring.

Biological Setting

Habitat— Croplands occur in association with Orchard-Vineyard, Pasture (Irrigated), Residential-Park, and wildlife habitats such as riparian, chaparral, wetlands, desert, and herbaceous types.

Wildlife Considerations— Croplands are established on the State's most fertile soils, which historically supported an abundance of wildlife unequalled in other sites. Croplands have greatly reduced the wildlife richness and diversity of California. Many species of rodents and birds have adapted to croplands and are controlled by fencing, trapping, and poisoning to prevent excessive crop losses (California Department of Food and Agriculture 1975). Prior to establishing State and Federal wildlife refuges, waterfowl depredation of crops was extensive. That problem has been essentially eliminated; however, some species of waterfowl depend on waste rice and corn that remain in the fields after harvesting (California Department of Fish & Game 1983). Deer, elk, antelope, and wild pigs forage in alfalfa and grain fields and can cause depredation problems. Pheasants introduced to the cropland habitat have experienced recent population declines owing to changes in crop patterns and cultural practices for growing small grains. Changes include clean farming, double cropping, and chemical control of rice diseases and pests rather than leaving land fallow in alternate years. Except for insectivores, raptors, doves, and pheasants, avian wildlife that becomes numerous and uses crops before they are harvested are generally not welcome by growers. Wildlife such as waterfowl, sandhill cranes, and other species that use waste grains after harvest are usually not discouraged. Croplands flooded for weed control, leaching, irrigation, or waterfowl hunting serve as freshwater wetlands for a variety of associated wetland wildlife, including shorebirds, wading birds, and gulls.

Physical Setting

Croplands are located on flat to gently rolling terrain. When flat terrain is put into crop production, it usually is leveled to facilitate irrigation. Rolling terrain is either dry farmed or irrigated by sprinklers. Soils often dictate the crops grown. Corn requires better soils than barley, which can grow on poor quality soils, and rice does well on clay soils not suitable for other crops. Leaching can remove contaminants in areas of high salt or alkali levels, making the soils highly productive. This has occurred extensively in the San Joaquin and Imperial Valleys. Climate also influences the type of crops grown. Only hardy crops such as potatoes, barley, and wheat do well in the short growing season in Klamath Basin; whereas, in the Imperial Valley, a variety of crops grow over an eleven month, frost-free growing season.

Distribution

There were over 5,768,100 acres of commercial cropland in California in 1983, located in every county but San Francisco (California Department of Food and Agriculture 1983). Hay was grown in nearly every county on more acreage than any other crop—1,480,000 acres. Cotton was second with 950,000 acres in the San Joaquin and Imperial Valleys. Wheat was third with 720,000 acres in all areas of the State except the north coast, 72 percent being produced in the Sacramento and San Joaquin Valleys (University of California 1983).

Literature Cited

California Department of Fish & Game. 1966. California fish and wildlife plan. California Department of Fish & Game, Sacramento.

California Department of Fish & Game. 1983.A plan for protecting, enhancing, and increasing California’s wetlands for waterfowl. California Department of Fish & Game, Sacramento.

California Department of Food and Agriculture. 1975. Vertebrate pest control handbook. California Dep. Food and Agric., Sacramento.

California Department of Food and Agriculture. 1983. California agriculture—1982. California Dep. Food and Agric., Sacramento.

Parker, I. and W.J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv. Reg. Ecol. Group, San Francisco.

University of California. 1983. California field crops: location of production and trends in acreage, yields, and production. 1945-1981. Univ. Calif. Bull. 1910.

California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

BARREN

Monica D. Parisi

Vegetation

Structure and Composition-- Barren habitat is defined by the absence of vegetation. Any habitat with <2% total vegetation cover by herbaceous, desert, or non-wildland species and <10% cover by tree or shrub species is defined this way. Structure and composition of the substrate is largely determined by the region of the state and surrounding environment. In the marine and estuarine environment, barren habitat includes rocky outcroppings in the intertidal and subtidal zones, open sandy beaches and mudflats. Along rivers, it includes vertical river banks and canyon walls. Desert habitats may be defined as barren when vegetation is widely spaced. Alpine barren habitat includes exposed parent rock, glacial moraines, talus slopes and any surface permanently covered with snow or ice. Urban settings covered in pavement and buildings may classified as barren as long as vegetation, including non-native landscaping, does not reach the % cover thresholds for vegetated habitats.

Other Classifications-- Most vegetation classification systems do not include a barren category. Sparsely vegetated substrate is assumed to be a component of the surrounding vegetation type. CALVEG (1981) defines a Barren and a Snow/Ice type. UNESCO (1996) includes a Barren type.

Habitat Stages

No stages are defined for this type. Many barren types will remain so during the time frame of consideration for management actions. An example is exposed rock in alpine settings, where the combined actions of freezing and thawing, wind and water erosion, and chemical breakdown caused by colonizing lichens eventually creates enough organic material to support higher plants. However, the time period for primary succession to a vegetated habitat type may be thousands of years.

Seasonal changes and management regimes may render some habitats barren for short periods of time. Alpine meadows may be seasonally covered with snow or ice. Disked or plowed agricultural fields will be barren for a few months until resowed. In an urban setting, newly-graded suburban sites converted from other habitat types may be barren for up to two years -- usually until trees, shrubs, lawns or other ground covers have been planted.

Biological Setting

Habitat-- Barren habitat may be found in juxtaposition with many different habitats, depending on the region of the state. Along the coast, barren mudflats are found with marine and estuarine habitats and fresh and saline emergent wetlands. Sandy beaches and sand dunes with less than 2% vegetative cover are themselves classified as barren. In the Central Valley, bluffs above river corridors covered with valley oak woodland, valley foothill-riparian or annual grassland habitat may drop sharply into steep barren riverbanks of loose soils. In an alpine setting, exposed parent rock is associated with subalpine conifer, red fir, lodgepole pine, pinyon-juniper, aspen, montane riparian, and montane chaparral habitats and, above timberline, with alpine dwarf shrub and wet meadow habitats. In the desert regions, palm oasis, Joshua tree, desert wash, desert succulent shrub, desert scrub and alkali desert scrub may all give way to a barren classification if conditions become extreme enough.

Wildlife Considerations-- Where there is little or no vegetation, structure of the non-vegetated substrate becomes a critical component of the habitat. Cormorants and many hawks and falcons nest on rock ledges. Plovers, stilts, avocets, several gulls and terns, nighthawks and poorwills rely on open ground covered with sand or gravel for constructing small scrape nests. Bank swallows use barren vertical cliffs of friable soils along river corridors to dig holes for nesting and cover. Rocky river canyon walls above open water are preferred foraging habitat for many bats. In the desert, open sandy soil is critical as burrowing and egg-laying substrate for horned lizards and fringe-toed lizards. Among alpine habitats, ground-dwelling mammals such as pika and marmots rely on talus slopes for cover.

Physical Setting

The physical settings for permanently barren habitat represent extreme environments for vegetation. An extremely hot or cold climate, a near-vertical slope, an impermeable substrate, constant disturbance by either human or natural forces, or a soil either lacking in organic matter or excessively saline can each contribute to a habitat being inhospitable to plants.

Distribution

Barren habitat occurs throughout the state at every elevation.

Literature Cited

Parker, I. and W.J. Maytas. 1981. CALVEG: A classification of California vegetation. USDA For. Serv. Reg. Ecol. Group. San Francisco, CA.

UNESCO: United Nations Educational and Scientific Organization 1996. International classification and mapping of vegetation.

Urban Vegetation

Joe R. McBride and Chris Reid

Structure-- The structure of urban vegetation varies, with five types of vegetative structure defined: tree grove, street strip, shade tree/lawn, lawn, and shrub cover. Tree groves, common in city parks, green belts, and cemeteries, vary in height, tree spacing, crown shape, and understory conditions, depending upon the species planted and the planting design. However, they have a continuous canopy. Mature tree groves in San Francisco vary in height from 19.3 m (64 ft) (eucalyptus) to 14.5 m (48 ft) (Monterey cypress). Ground cover in these groves ranges from 0 to 90 percent (McBride and Froehlich 1 984). Street tree strips show variation in spacing of trees, depending upon species and design considerations. Both continuous and discontinuous canopies are observed. Most street tree strips are planted in grass, but other ground covers are not uncommon. Shade trees and lawns are typical of residential areas and reminiscent of natural savannas. Structural variation in the shade tree/lawn type is typical when a large number of species are incorporated in the landscape. Lawns are structurally the most uniform vegetative units of the California urban habitat. A variety of grass species are employed, which are maintained at a uniform height and continuous ground cover. Biomass productivity is greater than natural grasslands because of irrigation and fertilization (Falk 1977). Shrub cover is more limited in distribution than the other structural types. Hedges represent a variation of the urban shrub cover type. Species, planting design, and maintenance control the structural characteristics of this types. Height ranges from 10 cm (4 in) tall to tree height.

The juxtaposition of urban vegetation types within cities produces a rich mosaic with considerable edge areas. The overall mosaic may be more valuable as wildlife habitat than the individual units in that mosaic.

Composition-- Species composition in urban habitats varies with planting design and climate. Monoculture is commonly observed in tree groves and street tree strips. A survey of tree groves in San Francisco parks showed that three species (eucalyptus, Monterey cypress, and Monterey pine) composed 75 percent of total tree cover (McBride and Froehlich 1984), and these species were almost exclusively planted in pure stands. Climatic variation associated with elevation in California also influences the mix of tree species. For example, in urban areas a comparison of urban forests found a species richness of 7 tree species per hectare (=3/acre) in South Lake Tahoe and 30 tree species/hectare (=12/acre) in Menlo Park. The difference in species richness is due largely to the low winter temperatures in South Lake Tahoe (McBride and Jacobs 1979).

A distinguishing feature of the urban wildlife habitat is the mixture of native and exotic species. Both native and exotic species are valuable, with exotic species providing a good source of additional food in the form of fruits and berries.

Other Classifications-- Detwyler (1972) has classified urban vegetation into four major types: the interstitial forest, consisting of trees growing between man's constructions (buildings, streets, etc.); parks and green zones, existing in blocks or sizable patches that are relatively unbroken by human construction; gardens, in which are green ornamental plants as well as food plants; and lawns, or interstitial grasslands. Clemens et al. (1984) suggest an additional classification unit, demolition sites those urban lands cleared of structures and supporting spontaneous vegetative cover. Many recent demolition sites in California cities are dominated by annual grasses and pioneer shrub species. The demolition site category also comprises vacant urban lands not supporting native vegetation types. Some commercial and industrial portions of urban areas are without any vegetative cover. These areas do, however, serve as habitat for a limited number of wildlife species.

Habitat Stages

Vegetation Changes-- Most units of urban vegetation are relatively static in species composition because of maintenance. Unmaintained units often are invaded by exotic and native species. Unmaintained forest groves at the Presidio, San Francisco, have developed locally dense understories of poison-oak or Algerian ivy. Lawns are commonly invaded by Bermuda grass and crab grass as well as broad leaved weeds (i.e., dandelion, English daisy, etc.).

Viewed from early urbanization to the present, urban vegetation appears less static. McBride and Jacobs (1976) describe changes in the preference of Menlo Park homeowners for different tree species over the last 100 years. The California pepper tree and London plane have been supplanted by camphor, Modesto ash, purple plum, and sweetgum. Vegetation structure also changes through time as a result of maturation. Tree and shrub height, and crown closure, increase during this maturation process.

Duration of Stages-- Urban vegetation, especially urban tree cover, is relatively recent only about 100 years. Many trees remain from presettlement forest or savanna and can be expected to survive for centuries. In contrast, most species in urban tree groves are not long-lived. For example, Monterey pine and Monterey cypress are relatively short-lived species, only 100 to 150 years. Windthrow and wind breakage are common to stands where these species exceed 90 years old (McBride and Froehlich 1984). In older stands in Golden Gate Park, San Francisco, tree defects were observed in 91 percent of Monterey pine and 56 percent of Monterey cypress trees (Smith et al. 1980).

Biological Setting

Habitat-- Urban development has occurred within or adjacent to most other habitats in California, with the highest density at lower elevations. The majority of urban developments exceeding 10,000 in population were developed in grassland or scrub (coastal sagebrush or chaparral) vegetation. Very probably the original vegetation at such locations was modified by agriculture and today most of our cities are surrounded by agricultural and grazing lands rather than natural vegetation.

Wildlife Considerations-- Three urban categories relevant to wildlife are distinguished: downtown, urban residential, and suburbia. The heavily-developed downtown is usually at the center, followed by concentric zones of urban residential and suburbs. There is a progression outward of decreasing development and increasing vegetative cover. Species richness and diversity is extremely low in the inner cover. Rock dove, house sparrow, and starling comprise over 90 percent of all avian density and biomass (Emlen 1974).

The urban residential zone is characterized by a denser and more varied mosaic of vegetation shade trees, lawns, hedges and planted gardens; approximately 40 percent of the land's surface is covered by impervious material. This region is characterized by a variety of bird species including scrub jay, mockingbird, house finch, (Jaeger and Smith 1966, Smith 1968, Guthrie 1974, Sproul 1975, Williams and Monroe 1976). Associates in the urban residential areas include the raccoon, opossum, striped skunk, (Berry and Berry 1959) and California slender salamander (Stebbins 1972).

Suburban areas with mature vegetation closely approximate the natural environment. In addition to landscaped gardens and lawns, relatively large tracts of adjacent natural vegetation such as chaparral, grasslands, and oak woodland abound. Wildlife diversity increases while species density decreases (Thomas and DeGraaf 1975) and proportionately greater numbers of native species occur. Bird species include wrentits, bushtits, plain titmouse, chestnut-backed chickadee, California quail, (Jaeger and Smith 1966, Smith 1968, Guthrie 1974, Sproul 1975, Williams and Monroe 1976). Common mammals are black-tailed deer, ringtail, black-tailed jackrabbit, (Berry and Berry 1959, Jaeger and Smith 1966, Williams and Monroe 1976). Gopher snake and western fence lizard also occur in this zone.

Physical Setting

Urban habitats are not limited to any particular physical setting. The first California cities were situated along coastline or major rivers providing marine or riparian habitats which continue to influence wildlife diversity in these cities.

Urban climate varies in temperature and wind velocity from the surrounding countryside (Lowry 1967). Heat islands, warmer zones in the most densely developed portions or cities, often show temperatures that are 3 to 5 C warmer than the undeveloped landscape. Wind velocities are reduced in urban areas except where highrise construction has occurred. Tall structures can funnel wind through man-made canyon to velocities well above those found over undeveloped landscape.

Distribution

The urban habitat occurs throughout California. From the smallest villages to the highest metropolitan areas, the urban habitat is the result of modifying presettlement vegetation and introducing new species.

Literature Cited

Berry, W. D., and E. B. Berry. 1959. Mammals of the San Francisco Bay Region. California Natural History Guide No. 2, Univ. of California Press, Berkeley.

Clemens, J., C. Bradley, and O. L. Gilbert. 1984. Early development of vegetation on urban demolition sites in Sheffield, England. Urban Ecology 8:139-148.

Detwyler, T. R. 1972. Urbanization and environment. Duxbury Press, Belmont, Calif.

Emlen, J. T. 1974. An urban bird community in Tucson, Arizona: derivation, structure, regulation. Condor 76:1 84-1 97.

Falk, J. H. 1977. The frenetic life forms that flourish in suburban lawns. Smithsonian 8(1):90-96.

Guthrie, D. A. 1974. Suburban bird population in Southern California. Amer. Midl. Nat. 92:461-466.

aeger, E. C., and A. C. Smith. 1966. Introduction to the natural history of southern California. California Natural History Guide No. 13, Univ. of California Press, Berkeley.

Lowry, W. P. 1967. The climate of cities. Sci. Amer. Aug:87-93.

McBride, J. R., and D. Froehlich. 1984. Structure and condition of older stands in parks and open space areas of San Francisco, California. Urban Ecology 8:165-178.

McBride, J. R., and D. Jacobs. 1976. Urban forest development: a case study, Menlo Park, California. Urban Ecology 2:1-14.

McBride, J. R., and D. Jacobs. 1979. Urban forest structure: a key to urban forest planning. Calif. Agric. 33(5): 24.

Smith, A. C. 1968. Introduction to the natural history of the San Francisco Bay Region. California Natural History Guide No. 1, Univ. of California Press, Berkeley.

Smith, S., D. Froehlich, and D. R. Miller.1980. Golden Gate Park forest management plan. State of California Resources Agency, Sacramento, Calif.

Sproul, M. 1975. The effect of surburbanization on bird populations in the Moraga area of California. M. S. thesis, Univ. of California, Berkeley.

Stebbins, R. C.1972. Amphibians and reptiles of California. California Natural History Guide. No. 31, Univ. of California Press, Berkeley.

Thomas, J. W., and R. M. DeGraaf. 1975. Wildlife habitats in the city. Pages 48-68 In Proceedings, Wildlife in Urban Canada, Univ. of Guelph, Ontario.

Williams, J. C., and H. C. Monroe. 1976. Natural history of northern California. Kendall/Hunt Publ. Co., Dubuque, lowa.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

FERC	Federal Energy Regulatory Commission
ft.	feet
mi.	miles
mm/yr	millimeters per year
msl	mean sea level
MTJ	Mendocino Triple Junction
MRDS	Mineral Resources Data System
mya	million years ago
PCB	polychlorinated biphenyls
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
SVOC	semi-volatile organic compound
TPH	total petroleum hydrocarbons
USGS	U.S. Geological Survey

3.3.6 Geology and Soils

This section describes the geology and soils in the vicinity of Pacific Gas and Electric Company's (PG&E) Potter Valley Hydroelectric Project (Project) and the surrounding area. Specifically, it describes the general tectonic, physiographic, and geologic setting; structural features and seismicity; bedrock lithology and stratigraphy; soils; groundwater; mineral resources; and glacial features. The information presented is focused on the areas and/or topics relevant to the decommissioning of the Project facilities. Additional related information is included in Section 3.3.7 – Geomorphology. A generalized geologic time scale is provided in Table 3.3.6-1 for reference.

Table 3.3.6-1. Simplified geologic time scale

Eon	Era	Period	Dates (mya = million years ago)
Phanerozoic (542.0 mya to present)	Cenozoic (65.5 mya to present)	Quaternary Holocene Pleistocene Tertiary	2.6 mya to present 11,700 years to present 2.588 mya to 11,700 years 65.5 to 2.6 mya
	Mesozoic (251.0 to 65.5 mya)	Cretaceous Jurassic Triassic	145.5 to 65.5 mya 199.6 to 145.5 mya 251.0 to 199.6 mya
	Paleozoic (542.0 to 251.0 mya)	Permian Carboniferous Devonian Silurian Ordovician Cambrian	299.0 to 251.0 mya 359.2 to 299.0 mya 416.0 to 359.2 mya 443.7 to 416.0 mya 488.3 to 443.7 mya 542.0 to 488.3 mya
Precambrian			

This table was adapted from Geologic Time Scale, University of California Museum of Paleontology (http://www.ucmp.berkeley.edu/help/timeform.php).

3.3.6.1 Information Sources

The information presented in this section is primarily based on information contained in the following source documents:

- Earthquake fault zones Lake Pillsbury 7.5-minute topographic quadrangle map (California Division of Mines and Geology [CDMG] 1995).
- *Geology and Ground Water in Russian River Valley Areas and in Round, Laytonville, and Little Lake Valleys, Sonoma and Mendocino Counties, California* (Cardwell 1965).
- United States Geological Survey's (USGS's) Mineral Resources Data System (MRDS) (USGS 2015).
- United States Department of Agriculture (USDA) – Natural Resources Conservation Service's (NRCS's) Soil Survey Geographical Data Base (SSURGO) (USDA-NRCS 2016).

- Geologic map of the Bartlett Springs fault zone in the vicinity of Lake Pillsbury and adjacent areas of Mendocino, Lake, and Glenn counties, California (Ohlin et al. 2010).
- Recently active traces of the Bartlett Springs fault, California (Lienkaemper 2010).
- *Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System, Potter Valley Area Hydro, Lake and Mendocino Counties, California* (PG&E 2016).
- *Integrated Geologic and Geophysical Modeling Across the Bartlett Springs Fault Zone, Northern California (USA): Implications for Fault Creep and Regional Structure* (Langenheim et al. 2024).
- California Department of Water Resources (DWR) Well Completion Report Map Application (DWR 2024).

3.3.6.2 Tectonic and Physiographic Setting

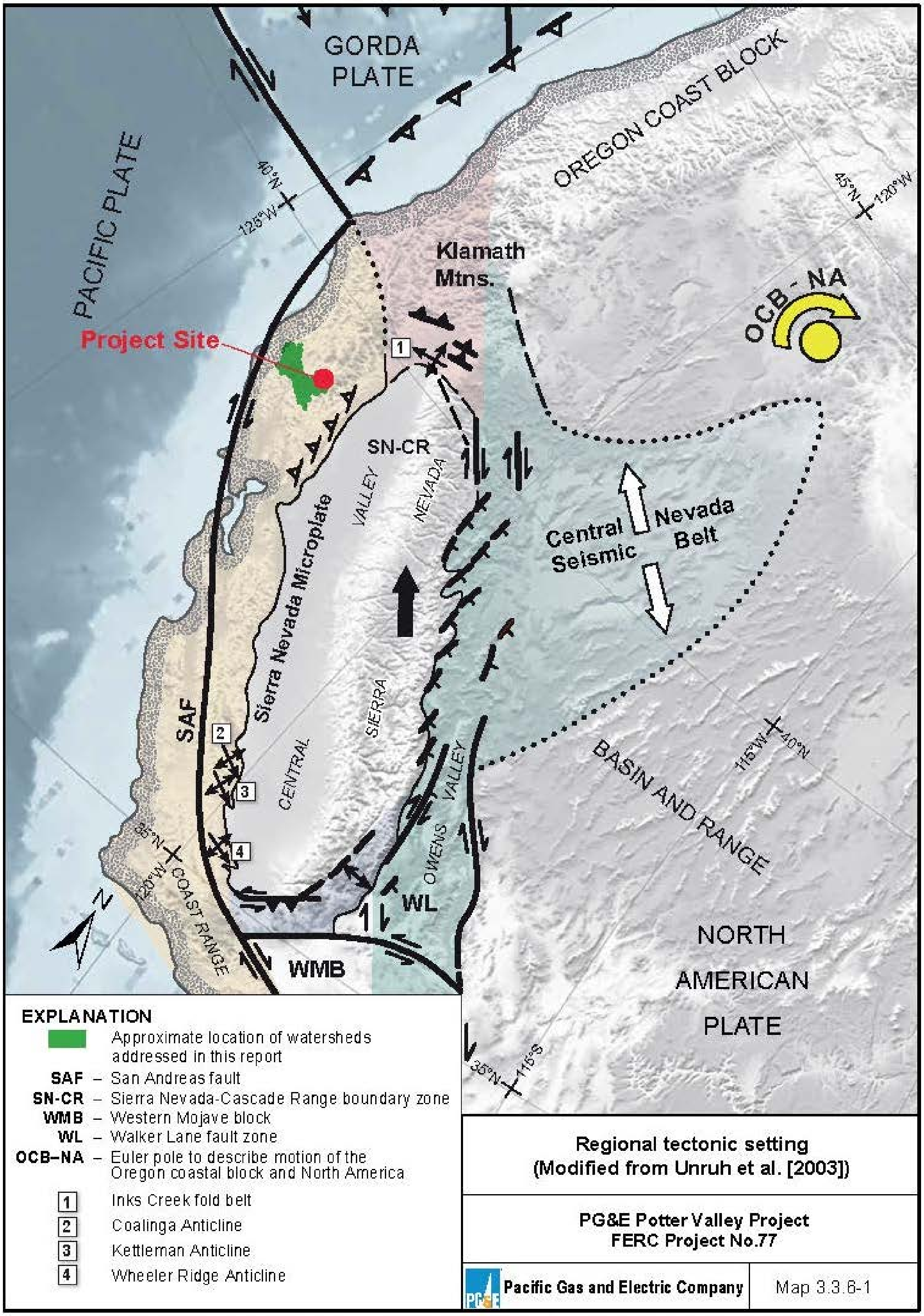
Northern California's current geologic features are a product of long-term tectonic activity associated with the subduction of the Gorda and Pacific plates beneath the North American Plate during the Paleozoic and Mesozoic eras (approximately 438 to 144 mya). Accretion of oceanic sediments along the western margin of the North American continent and their subsequent uplift and intrusion by granitic batholiths, including intermittent periods of volcanism, have resulted in the formation of California's present-day landscape and the geologic features associated with the Project. Map 3.3.6-1 shows the regional tectonic setting.

The Project is located in the Coast Ranges of California, which extend approximately 400 miles (mi.) from Santa Barbara to Eureka, and are bound to the west by the Pacific Ocean and to the east by the Central Valley. The Coast Ranges consist of two physiographic provinces, the Northern Coast Ranges and the Southern Coast Ranges, which are informally divided by the San Francisco Bay. All of the Project facilities and associated river reaches are located in the Northern Coast Ranges.

The Northern Coast Ranges consist of three distinct geomorphic regions: the Eastern belt, the Central belt, and the Western (coastal) belt (Map 3.3.6-2). These three parallel belts are characterized by rugged northwest-southeast-trending ridges separated by intervening valleys. The Eastern belt includes some of the highest peaks in the Northern Coast Ranges, including Snow Mountain with a summit elevation of 7,057 feet (ft.) above mean sea level (msl). The Central belt is characterized by mountains with elevations up to 4,300 ft. above msl, separated by the intervening valleys, including the well-known Napa Valley. The Western (coastal belt borders the coastline from San Francisco Bay to Cape Mendocino. The bedrock and geologic structures underlying these three belts control the alignment of the ridges and valleys and the drainage patterns of most of the streams and rivers in the Northern Coast Ranges (Ohlin et al. 2010; PG&E 2016).

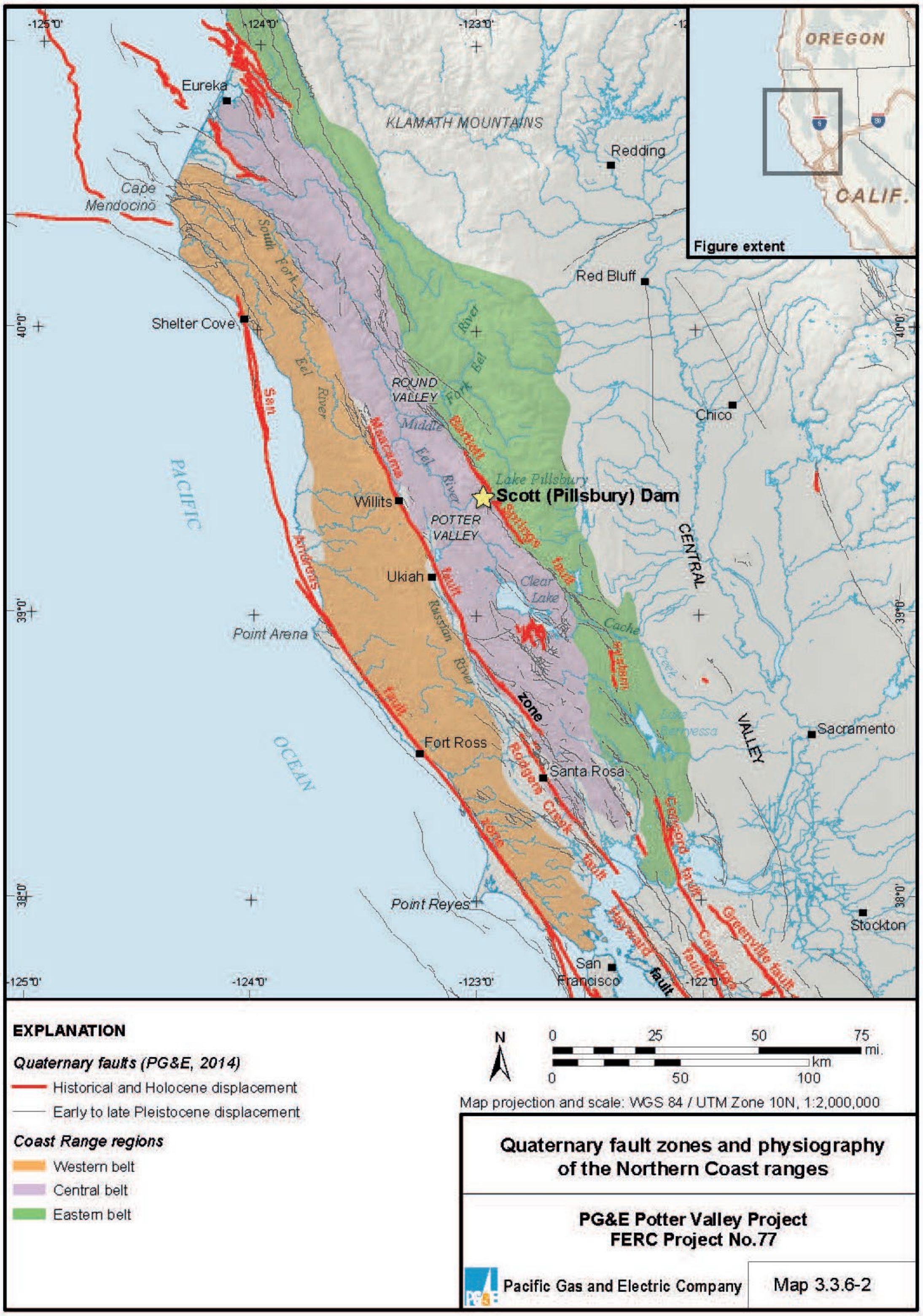
3.3.6.3 Geologic Setting

The Northern Coast Ranges are underlain by the deformed Mesozoic rocks of the Franciscan Complex, consisting of an accumulation of sedimentary, metamorphic, and igneous rocks that were assembled in a subduction zone and accreted to the western margin of the modern North American Plate between the Late Jurassic and Miocene (Jayko et al. 1989; Ohlin et al. 2010). The regional geologic setting is shown on Map 3.3.6-3.



Source: Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System, Potter Valley Area Hydro, Lake and Mendocino Counties, California (PG&E 2016)

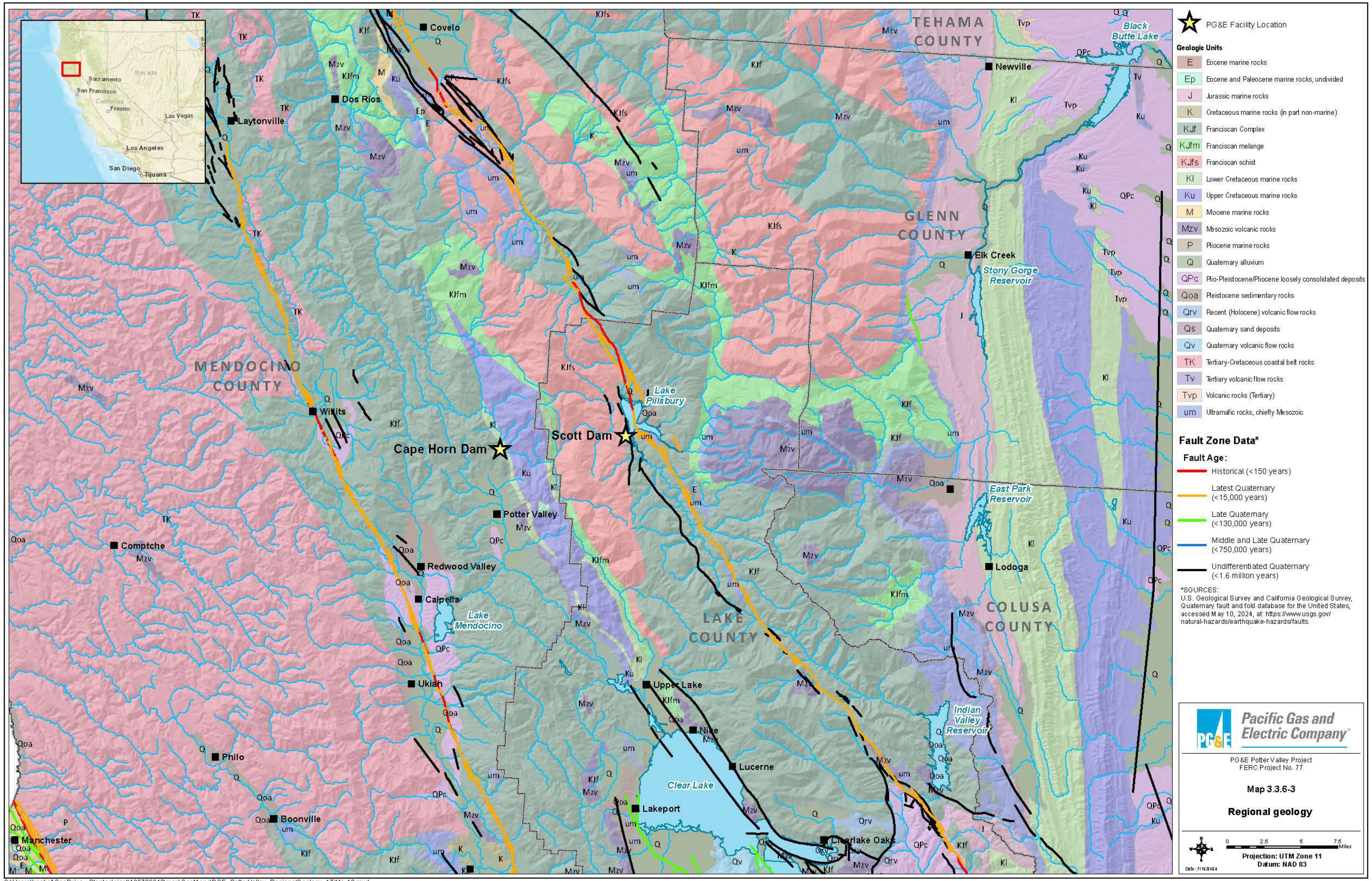
Map 3.3.6-1. Regional tectonic setting.



Source: Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System, Potter Valley Area Hydro, Lake and Mendocino Counties, California (PG&E 2016)

Map 3.3.6-2. Quaternary fault zones and physiography of the Northern Coast Ranges.

This Page Intentionally Left Blank



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\GeoMaps\PGE_PotterValley_RegionalGeology_17i11i_10.mxd

Map 3.3.6-3. Regional geology.

This Page Intentionally Left Blank

In general, uplift caused by the subduction of the Pacific Plate beneath the North American Plate formed the Coast Ranges. The subduction of the Gorda Plate beneath the North American Plate at the Mendocino Triple Junction (MTJ) further influenced the geomorphic evolution of the Northern Coast Ranges (see Map 3.3.6-1). Movement along the boundaries of these three plates is continuing today and is responsible for the high heat flow and volcanic activity in portions of the Northern Coast Ranges, as well as seismic activity along the San Andreas and associated fault zones (PG&E 2016).

3.3.6.4 Structural Features and Seismicity

The Northern Coast Ranges are dominated by structures associated with the San Andreas fault and other regionally significant faults associated with the boundary between the Pacific and the North American plates. The evolution of the San Andreas fault in Northern California is closely tied to the northward migration of the MTJ (Atwater 1970). In the Northern Coast Ranges, strike-slip faulting along the San Andreas fault system splays into several separate major faults across a 50-mi.-wide zone. As shown in Map 3.3.6-2, from west to east, the major structures in this system are the San Andreas fault, the Rodgers Creek-Maacama fault system, and the Green Valley–Bartlett Springs fault system (PG&E 2016). All three of these structures have been active in the Quaternary and are associated with ongoing seismic activity. Geomorphic evidence indicates late Holocene displacement (PG&E 2016) along all three fault systems. The Bartlett Springs fault, located east of Scott Dam, is the most significant seismic feature near the Project (PG&E 2016) and is described further below.

Seismicity

Various types of earthquake records for the Project vicinity are available as far back as the late 19th century. Historic (1800–1974) and instrumental (1975–present) seismicity within a 100-mi. radius of center of the Project area is shown on Map 3.3.6-4 shows the location of earthquake magnitudes ranging from M4.0 to >M7.0. Dates of occurrence of earthquakes >M6.0 are identified on the map. The largest earthquake event on record (M7.2) occurred in 1992 near Petrolia, California, approximately 90 mi. northeast of the center of the Project area. The largest closest earthquake event (M6.7) occurred in 1898 and is located near the offshore continuation of the San Andreas fault zone, roughly 47 miles to the south-southwest.

Regional seismicity, as recorded by strong motion instruments from 1975 to 2014, is characterized by a diffuse pattern of minor earthquakes (<M5.0) northwest of the Bartlett Springs fault system and concentrated activity along the Rodgers Creek-Maacama and Bartlett Springs fault systems (PG&E 2016). Activity along the Bartlett Springs fault system itself is concentrated primarily along a 25-mi.-long section of the Bartlett Springs fault zone near Scott Dam. The largest recorded earthquake event in proximity to the Bartlett Springs faults occurred on August 10, 2016, and produced a M5.1 earthquake event with an epicenter located approximately 9 mi. southeast of Scott Dam.

Bartlett Springs Fault

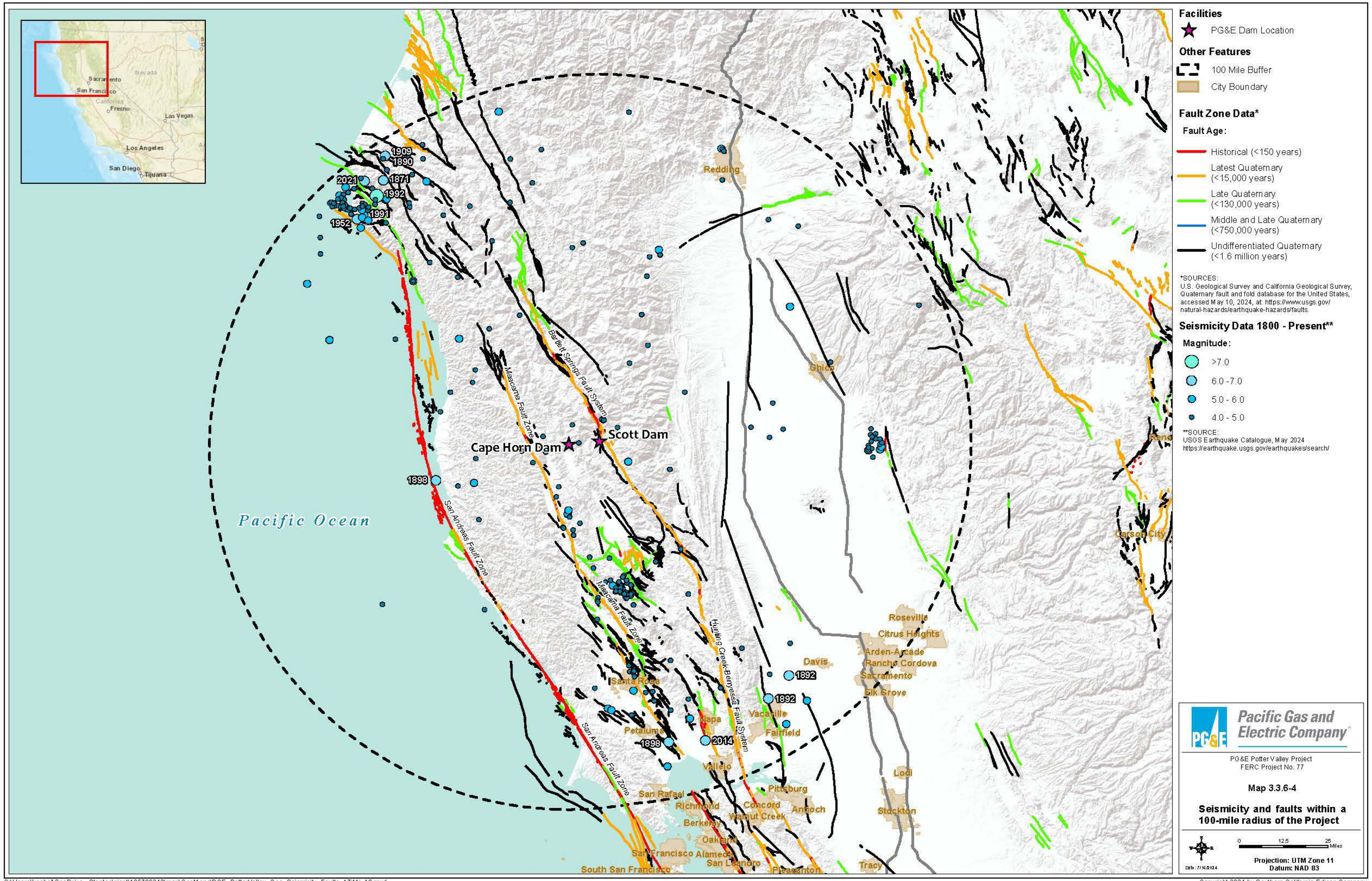
As part of a Cooperative Research and Development Agreement, PG&E partnered with the USGS in a series of long-term studies to characterize the geologic and seismic setting of Scott Dam, including geologic constraints and ground-motion estimates for the nearby Bartlett Springs fault. The findings of these evaluations are summarized in the following PG&E report, *Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System* (PG&E 2016) and are documented in technical reports by USGS scientists (Langenheim et al. 2007; Lienkaemper 2010; Langenheim et al. 2024; Ohlin et al. 2010).

The Bartlett Springs fault is a right-lateral strike-slip fault that is part of the San Andreas fault System in Northern California, with an estimated slip rate of approximately 7 millimeters per year (mm/yr). Near Lake Pillsbury, the slip rate of the fault is expressed as fault creep at a rate of 0.2 to 3.4 mm/yr. Lozos et al. (2015) rupture models estimate that an earthquake on the Bartlett Springs fault could produce a magnitude range of M6.32 to M7.24.

First recognized by geologists as a regionally significant seismic source in the 1980s, the Bartlett Springs fault is the northward continuation of the Calaveras–Green Valley fault system and includes both the Round Valley fault and the Bartlett Springs fault zone (Map 3.3.6-2 and Map 3.3.6-5). The fault has a general strike of N35W and a length of about 86 mi. The Bartlett Springs fault zone is the main fault in the Bartlett Springs fault system and extends 50 mi. from the Middle Fork of the Eel River southeast of Round Valley, past Lake Pillsbury and Bartlett Springs to just north of Cache Creek (Lienkaemper 2010). The Bartlett Springs Fault is part of the wide zone of earthquake faults generated by the boundary between the Pacific and the North American plates along the San Andreas fault, which governs the geology of most of California.

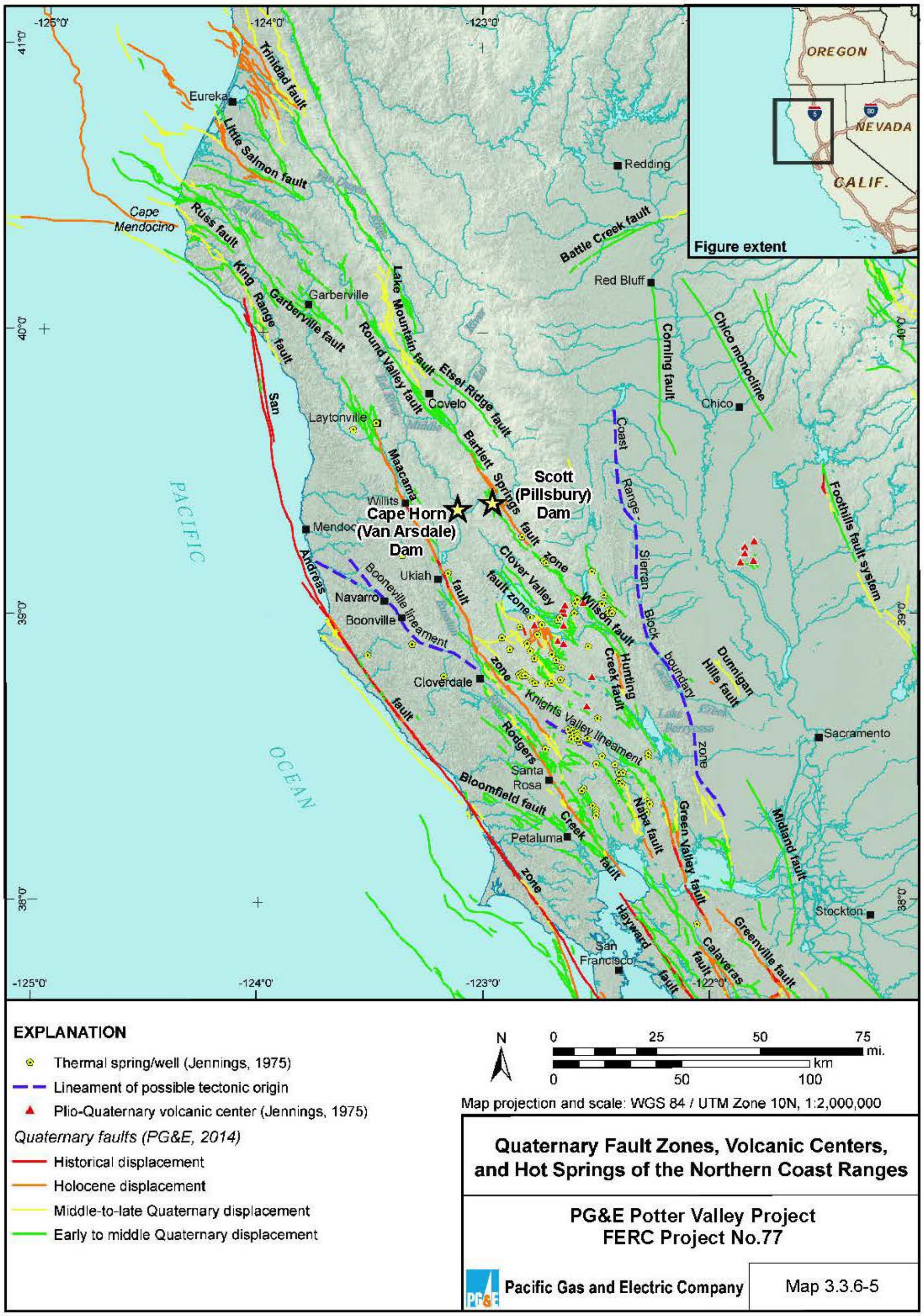
The surface expression of the fault zone follows a series of small structural basins, narrow valleys, and low drainage divides. The geomorphic features generally coincide with a 0.9-mi.-wide zone of Franciscan mélange and ultramafic rocks that marks the location of the Tertiary subduction zone, which follows the boundary between the Central and Eastern belts of the Northern Coast Ranges (Map 3.3.6-2). Several major creeks and rivers drain linear valleys that are eroded into weak, sheared rocks of the former subduction zone. These include the North Fork of Cache Creek, the Rice Fork of Eel River, and Elk Creek. Fault exposures with pervasively altered serpentine and steeply dipping chaotic rocks are present in exposures along the southern portion of the Bartlett Springs fault zone (Lienkaemper 2010; Ohlin et al. 2010).

The Bartlett Springs fault is considered active by the California Geological Survey (formerly California Division of Mines and Geology) and has the potential for surface rupture. The Bartlett Springs fault has been mapped in accordance with the Alquist-Priolo Earthquake Zoning Act (CDMG 1995) (Map 3.3.6-6). Alquist-Priolo earthquake fault zones are regulatory zones surrounding the surface traces of active faults in California. A fault trace is a line on the Earth's surface defining a fault. Wherever an active fault exists, if it has the potential for surface rupture, a structure for human occupancy cannot be placed over the fault and must be a minimum distance from the fault (generally 50 ft.). Local agencies regulate development projects within earthquake fault zones. Before a new project can receive a building permit, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults.



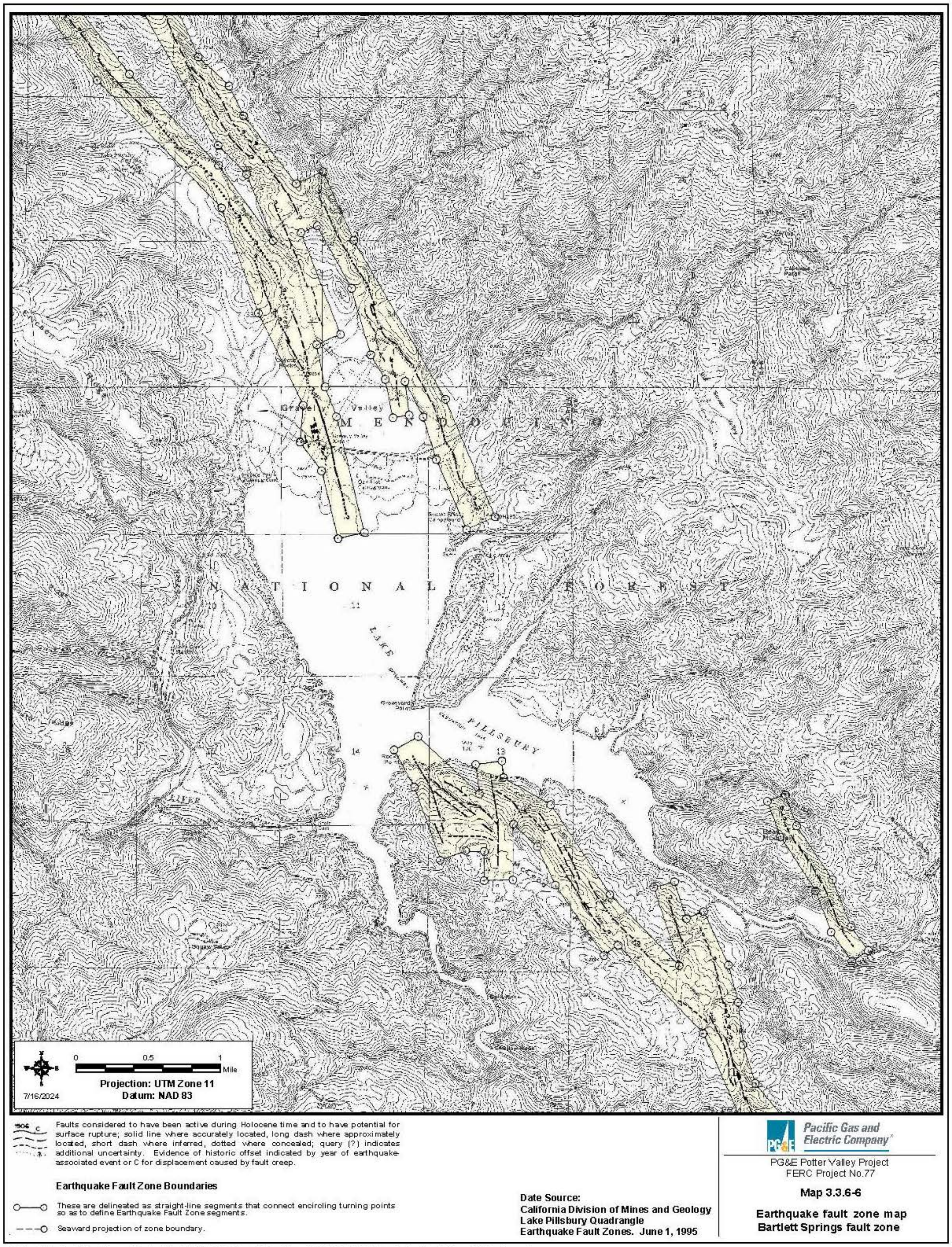
Map 3.3.6-4. **Seismicity and faults within a 100-mi. radius of the Project.**

This Page Intentionally Left Blank



Source: *Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System, Potter Valley Area Hydro, Lake and Mendocino Counties, California (PG&E 2016)*

Map 3.3.6-5. Quaternary fault zones, volcanic centers, and hot springs of the Northern Coast Ranges.



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\GeoMaps\PGE_PotterValley_BartlettFaultZone_8i11i_11.mxd

Map 3.3.6-6. Earthquake fault zone map (Bartlett Springs Fault Zone).

3.3.6.5 Bedrock Lithology and Stratigraphy

The Eel River upstream of Lake Pillsbury transects the Eastern belt to the northeast (Maps 3.3.6-2 and 3.3.6-3). The basement rocks underlying the Eastern belt include the Franciscan Formation and serpentinized ultramafic rocks. In the central and northern parts of the Eastern belt, pre-Cretaceous metasedimentary rocks overlie the basement (PG&E 2016).

The Project facilities are primarily located in the Central belt (Maps 3.3.6-2 and 3.3.6-3). The rocks underlying the Central belt are varied; the basement rocks are Franciscan Complex rocks, with serpentine and stringers of ultramafic rocks. In the southern portion of the Central belt, extensive deposits of the Mio-Pliocene Sonoma volcanics overlie the Franciscan rocks (Ohlin et al. 2010). The basins and valleys in the Central belt are underlain by deep alluvium, with margins flanked by continental sedimentary rocks including claystone, siltstone, and fluvial gravel and sand (Langenheim et al. 2007; PG&E 2016). Geologic units in the Project vicinity and along the Bartlett Springs fault are characterized by extensive landslides, particularly between Gravelly Valley and the Middle Fork of the Eel River (Ohlin et al. 2010; PG&E 2016).

The Eel River below Dos Rios north of the Project facilities and the East Branch of the Russian River south of the Project facilities upstream of Lake Mendocino bisects the Coastal belt (Maps 3.3.6-2 and 3.3.6-3). Basement rocks in the Coastal belt are composed primarily of sandstone, greenstone, and metagraywacke of the Franciscan complex, with northerly trending stringers and layers of serpentinized ultramafic rock. In the northern portion of the Coastal belt, including the area west of the Project, the Franciscan rocks are overlain by late Cretaceous and Tertiary rocks. These younger rocks consist of marine sandstone, shale, conglomerate, and minor limestone (PG&E 2016).

Unconsolidated Sediments

Numerous Quaternary terrace deposits and more recent Holocene alluvial deposits are present in the Project area (Ohlin et al. 2010). A geologic map of the Lake Pillsbury area is shown on Map 3.3.6-7. The largest terrace deposit is the thick sequence of weakly consolidated sands and gravels that covers most of the valley on the east side of Lake Pillsbury from 1,700 ft. near Scott Dam (USGS 1922) up to an elevation of 2,300 ft. above msl. The most significant alluvial deposits in the area include Gravelly Flat, which forms the valley floor immediately north of Lake Pillsbury; the flat valley bottom around Van Arsdale Reservoir; and Potter Valley (FERC 1978). Otherwise, unconsolidated sediments in the Project vicinity are generally limited to surface soils and recent alluvium—deposited in the stream and river courses and associated terraces—and colluvium.

Geophysical surveys completed by the USGS provide constraints on basin geometry beneath Lake Pillsbury and Potter Valley and suggest maximum basin depths of approximately 1,300 ft. to 1,500 ft., respectively (Langenheim et al. 2007). Unconsolidated sediments pertaining to fluvial geomorphology are discussed further in Section 3.3.7.

Soils

Soils found within 1 mi. of the Project facilities and the Eel River between Scott Dam and Van Arsdale Reservoir are shown on Map 3.3.6-8. Detailed descriptions of the soils shown on Map 3.3.6-8 are available at https://casoilresource.lawr.ucdavis.edu/gmap/ (UC Davis 2024) and summarized in Table 3.3.6-2. Soils are grouped by alluvial/floodplain deposits, terraces, and hills and mountain slopes. A summary of the soils that occur in the vicinity of the Project as documented by the Federal Energy Regulatory Commission (FERC 1978) is provided in the following paragraphs.

Soils in the Eel River drainage are well-drained, loamy, and of medium acidity. In the area around Lake Pillsbury and other areas on the Eel River, the soils are generally shallow, gravelly loams formed on 15–75 percent slopes. The steep slopes, shallow thickness, low hydraulic conductivity and transmissivity, and very high erosion susceptibility of these particular soils preclude their use for cultivated crops, pasture, grazing, or industrial forestry. Soils formed on the level to moderately sloping surfaces of the river wash and alluvial deposits, such as the soils at the north end of Lake Pillsbury, are deep, well-drained sands, gravels, and cobbles. These soils have very high infiltration rates and low runoff potential. However, their erosion hazard is very high (USDA 1970).

Near Van Arsdale Reservoir, soils on slopes ranging from 0–30 percent have a moderate erosion hazard and are marginally suited for cultivation. Steeper slopes (30–50 percent) have higher erosion potential, which precludes their use for cultivated crops. Areas with steeper slopes are useful primarily for pasture, range, woodland, and wildlife.

Potter Valley, including the area bisected by the East Branch Russian River, is characterized by thick deposits of alluvium (40–60 ft. thick) overlying Pliocene and Pleistocene continental deposits on the west side of the valley and bedrock and terrace deposits on the east side of the valley (Cardwell 1965). The terrace deposits are best exposed on the southeastern part of the valley and are composed of floodplain, fan, and lacustrine deposits, accumulated after the present valley was formed, and mostly eroded away before the alluvium was deposited (Cardwell 1965). Soils on the alluvial and terrace deposits in Potter Valley are very deep, well to moderately rapidly drained, medium to slightly acid, very fine sandy loam and silt loam. These soils have few limitations or hazards and are suited to cultivated crops, pasture, range, woodland, or wildlife. Soils on the hills surrounding Potter Valley, including the area of the penstocks and the powerhouse, are moderately deep to deep, medium-acid loams. Slopes range from 0–75 percent (level to very steep), and the erosion susceptibility of these soils is moderate to very high. These soils are primarily used for grazing (USDA 1972).

Reservoir Sediments

GeoSyntec (2019) conducted a Preliminary Environmental Contamination Source Assessment, which identified historical activities that could contribute to a release of contaminants and accumulate in sediments behind Scotts Dam and Cape Horn Dam. Subsequently, Geosyntec (2020) designed and implemented a sediment characterization investigation for Lake Pillsbury and Van Arsdale Reservoir to support the California State Coastal Conservancy with an evaluation of current sediment quality conditions. The objective was to chemically analyze the soft reservoir sediments that have accumulated behind the Scott and Cape Horn dams and could potentially mobilize upon dam removal. Analytical results were compared to published freshwater sediment screening levels and background concentrations. Overall, the results indicated that the Lake Pillsbury and Van Arsdale Reservoir sediments are generally not contaminated and represent background conditions for remote reservoirs. Specific analytical findings were as follows:

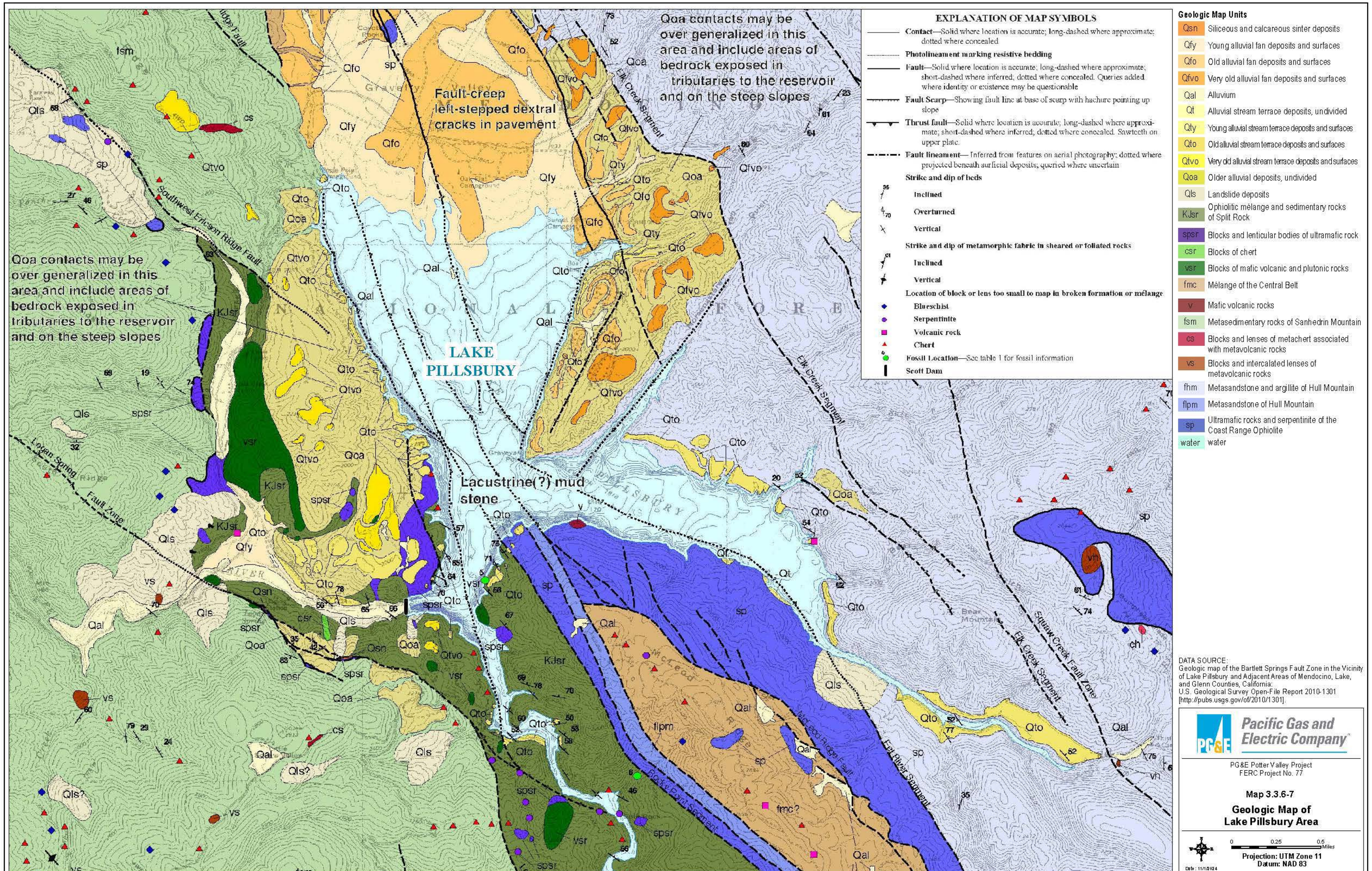
- Many constituents were not detected, including polychlorinated biphenyls (PCBs), organophosphate pesticides, herbicides, diesel-range organics (total petroleum hydrocarbons [TPH]), asbestos, many semi-volatile organic compounds (SVOCs), some metals (i.e., antimony, beryllium, cadmium, molybdenum, selenium, silver, thallium), and most organochlorine pesticides.
- The chemicals/metals detected included some metals, methylmercury, some SVOCs, motor-oil-range TPH, methyoxychlor, and two dioxin congeners (in Van Arsdale Reservoir only). Except for nickel, all other detected chemicals were below freshwater sediment screening levels. Nickel concentrations were elevated about two- to three-fold above the screening levels, but are likely indicative of background concentrations in this area, as they fall within the range of concentrations measured in other reservoirs and California soils.

3.3.6.6 Slope Stability

Landslides are common throughout the Eel River watershed (PG&E 2021). Although a landslide immediately upgradient of Scott Dam and landslides downstream of Scott Dam along the Eel River have been mapped, the Quaternary deposits in the vicinity of Lake Pillsbury appear to be generally stable (Map 3.3.6-7). However, sedimentary deposits on steep slopes around Lake Pillsbury may be at risk of slope failure if rapid changes in water level occur when Lake Pillsbury is drained, and Quaternary deposits, landslide debris, and Quaternary alluvium downstream of Scott Dam may also be at risk of slope failure and/or erosion if a sudden rise of water level in the Eel River were to occur.

Erosion susceptibility was discussed above in Section 3.3.6.5. Slope stability of sedimentary deposits is dependent on the shear strength of the geological materials and seepage. Quaternary deposits on the steep slopes surrounding Lake Pillsbury and downstream of Scott Dam could become unstable if sudden changes in water levels were to occur as Lake Pillsbury is drained by reducing or increasing saturation of the surrounding sedimentary deposits.

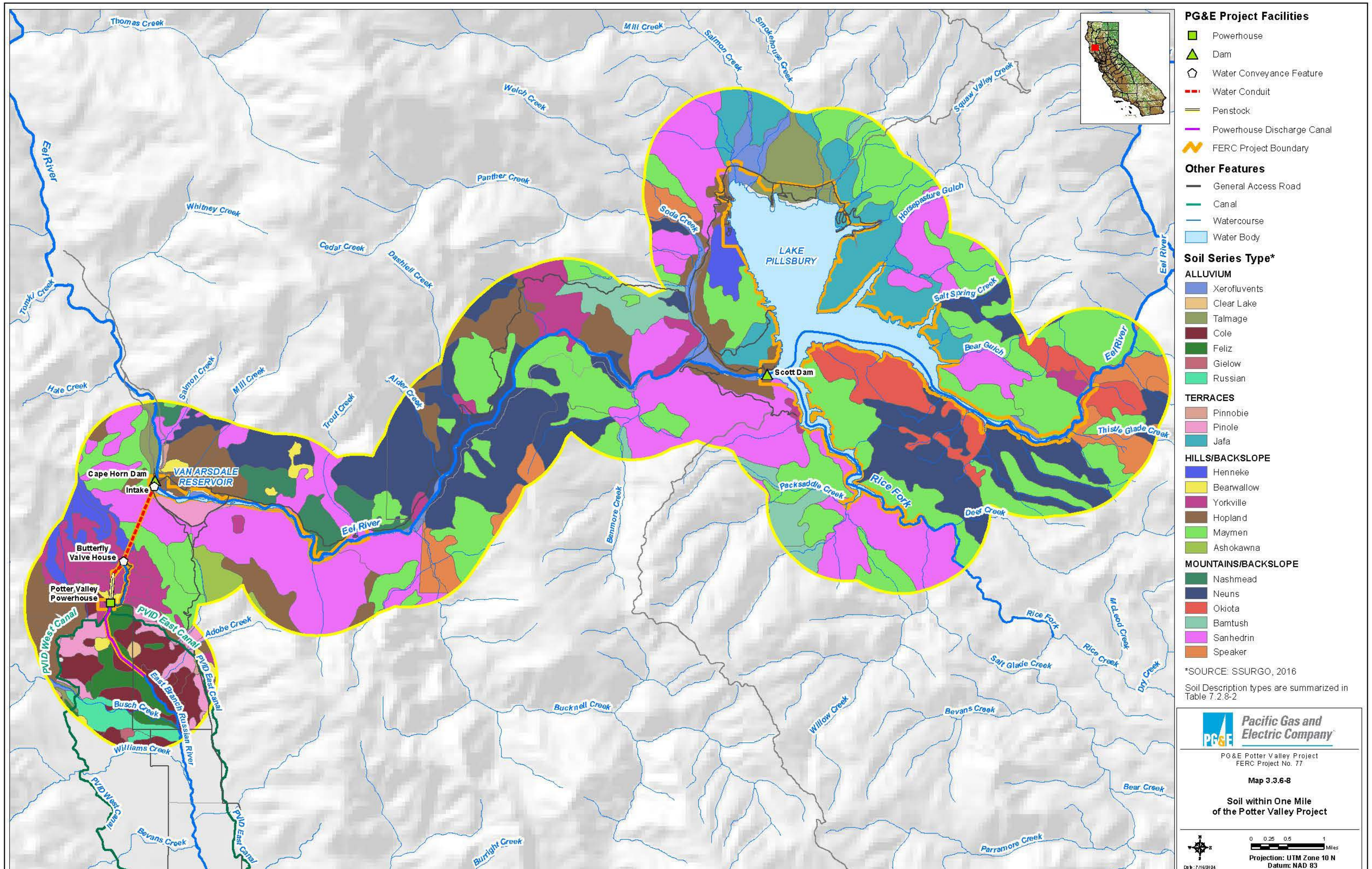
This Page Intentionally Left Blank



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\GeoMaps\PGE_PotterValley_LakePillsburyGeology_17i11i_10.mxd

Map 3.3.6-7. Geologic map of the Lake Pillsbury area.

This Page Intentionally Left Blank



Map 3.3.6-8. Soils within 1 mile of the Potter Valley Hydroelectric Project Boundary.

This Page Intentionally Left Blank

Table 3.3.6-2. Soil types in the vicinity of the Potter Valley Hydroelectric Project.

Soil Name	Soil Description	Slope (%)	Parent Rock	Runoff	Geographic Position
ALLUVIUM					
Xerofluvents	–	0	Alluvium	Excessively drained	River wash / Floodplain / Channel
Clear Lake	Clay	0 to 2	Clayey alluvium derived from metamorphic and sedimentary rock	Poorly drained; high runoff	Basin floor
Talmage	Gravelly sandy loam	–	Alluvium	Somewhat excessively drained; very low runoff	Floodplain
Gielow	Sandy loam	0 to 5	Alluvium	Somewhat poorly drained; low runoff	Floodplain
Russian	Gravelly loam	0 to 2	Alluvium derived from sedimentary rock	Well-drained; low runoff	Floodplain
Cole	Loam	0 to 2	Alluvium	Somewhat poorly drained; high runoff	Alluvial fan
Feliz	Loam	0 to 2	Alluvium	Well-drained; low runoff	Alluvial fan
TERRACES					
Pinnobie	Loam	2 to 8	Alluvium	Well-drained; medium runoff	Terraces
Pinole	Gravelly loam	2 to 8	Alluvium derived from sedimentary rock	Well-drained; high runoff	Terraces
Jafa	Fine-loamy	5 to 30	Alluvium	Well-drained; medium runoff	Terraces
HILLS/BACKSLOPE					
Henneke	Rock outcrop	10 to 50	Residuum weathered from serpentinite	Well-drained; very high runoff	Hills/Backslope
Bearwallow	Loam	15 to 30	Residuum weathered from sandstone and shale	Well-drained; very high runoff	Hills/Backslope

Soil Name	Soil Description	Slope (%)	Parent Rock	Runoff	Geographic Position
Yorkville	–	15 to 50	Residuum weathered from mica schist and/or residuum weathered from metamorphic and sedimentary rock	Moderately well-drained; very high runoff	Hills/Backslope
Hopland	–	30 to 50	Colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale	Well-drained; very high runoff	Hills/Backslope
Maymen	Loamy	30 to 75	Colluvium derived from sandstone and shale	Somewhat excessively drained; high runoff	Hills/Backslope
Ashokawna	Loamy	50 to 75	Colluvium derived from sandstone and/or residuum weathered from sandstone	Well-drained; high runoff	Hills/Backslope
MOUNTAINS/BACKSLOPE					
Okiota	–	15 to 50	Residuum weathered from serpentinite	Well-drained; very high runoff	Mountains/Backslope
Nashmead	Gravelly sandy loam	30 to 50	Residuum weathered from sandstone and shale	Well-drained; medium runoff	Mountains/Backslope
Bamtush	Loamy	50 to 70	Residuum weathered from sandstone	Well-drained; high runoff	Mountains/Backslope
Neuns	Loamy	30 to 50	Residuum weathered from sandstone	Well-drained; medium runoff	Mountains/Backslope
Sanhedrin	Fine-loamy	30 to 75	Residuum weathered from sedimentary rock	Well-drained; low to very high runoff	Mountains/Backslope
Speaker	Fine-loamy	30 to 75	Residuum weathered from sandstone and shale	Well-drained; high runoff	Mountains/Backslope

Note: – = Information not provided

3.3.6.7 Groundwater

Private residents, businesses, and the developed recreation facilities surrounding Lake Pillsbury rely on groundwater wells for water. Detailed information about the groundwater wells in the vicinity of Lake Pillsbury is not readily available. However, the California Department of Water Resources Well Completion Report Map Application (DWR 2024) identifies square-mile sections where groundwater wells are present. Map 3.3.6-9 shows the general location and density of domestic and municipal water wells in the highlighted 1-square-mi. sections. Well density in the vicinity of Lake Pillsbury ranges from 1 to 10 wells per square mile.

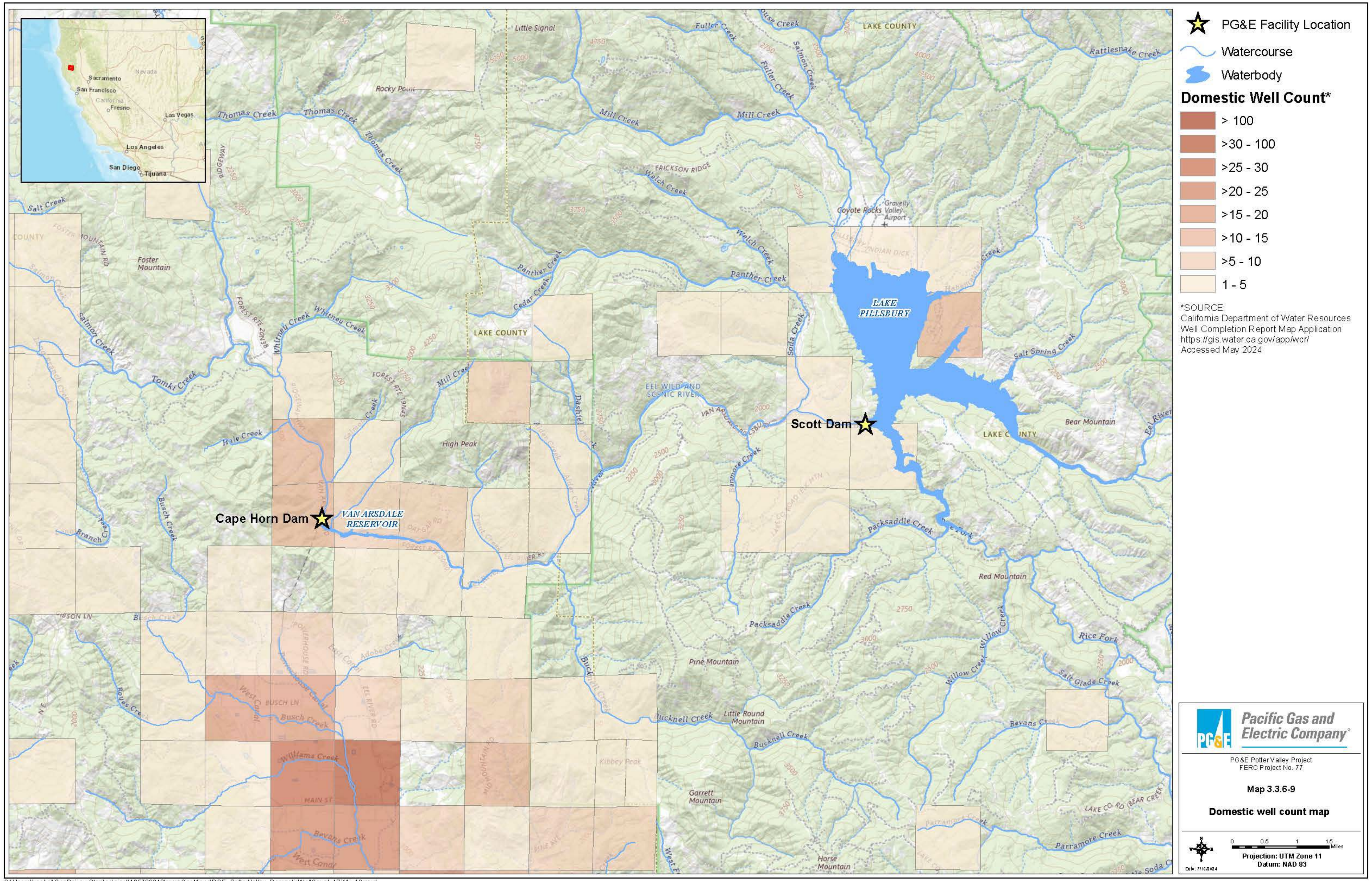
3.3.6.8 Mineral Resources

Mineral resources in the vicinity of the Project are shown on Map 3.3.6-10, which was developed using information available through the USGS MRDS (https://mrdata.usgs.gov/mrds/). Additional information about each occurrence shown on Map 3.3.6-10 is summarized in Table 3.3.6-3, which was also developed using information available in the MRDS. As indicated, chromium manganese and mercury occur in the vicinity of the Project, especially around Lake Pillsbury, with chromium being the most prevalent. These minerals are common in the Coast Ranges, especially in the Franciscan Formation. As indicated in Table 3.3.6-3, development status of only one of these occurrences is categorized as a "producer," a manganese deposit located near the northwest end of Lake Pillsbury. An active (i.e., producing) sand and gravel quarry is present in the vicinity of Lake Pillsbury near the junction of Elk Mountain Road and Scott Dam Road, and an active stone and crushed rock quarry is present in the vicinity of Potter Valley.

3.3.6.9 Glacial Features

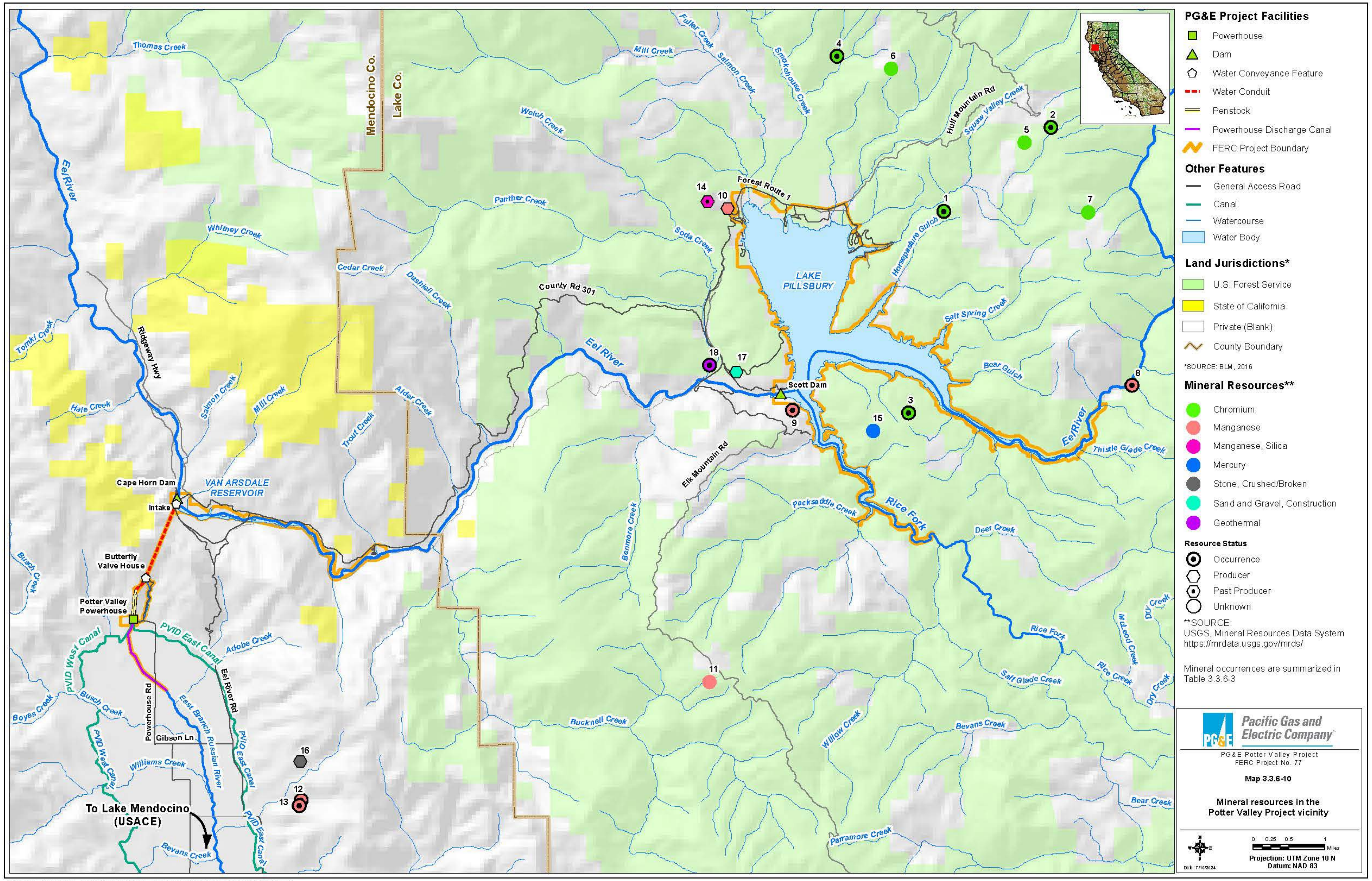
There are no glaciers or glacial features or deposits in the immediate vicinity of the Project. The nearest documented glacial deposits are located within the Snow Mountain volcanic complex, approximately 15 mi. southeast of Lake Pillsbury (Holway 1911).

This Page Intentionally Left Blank



Map 3.3.6-9. Domestic well count map.

This Page Intentionally Left Blank



Map 3.3.6-10. Mineral resources in the Project vicinity.

This Page Intentionally Left Blank

Table 3.3.6-3. Mineral occurrences in the vicinity of the Project.

Map ID	Site Name	County	Commodities (Primary / Secondary)	Ore or Other Material	Type	Development Status
1	Unknown	Lake	Chromium	Chromite (Ore)	Unknown	Occurrence
2	Cabbage Head Or Fir Root Ridge Claim	Lake	Chromium	Chromite (Ore)	Unknown	Occurrence
3	Unknown	Lake	Chromium	Chromite (Ore)	Unknown	Occurrence
4	Bull Mountain Lode	Lake	Chromium	Chromite (Ore)	Unknown	Occurrence
5	Cabbago Send	Lake	Chromium	–	Underground	Unknown
6	Hull Mountain Lodge	Lake	Chromium	–	Surface	Unknown
7	Unnamed Location	Lake	Chromium	–	Surface	Unknown
8	Long Shot Claim	Lake	Manganese / Chromium	–	Unknown	Occurrence
9	Cartwright Manganese Prospect	Lake	Manganese	Chert	Surface	Occurrence
10	Gravelly Valley	Lake	Manganese	–	Unknown	Producer
11	Black Rock	Lake	Manganese	–	Surface	Unknown
12	Hopper	Mendocino	Manganese	–	Unknown	Occurrence
13	Hopper Prospect	Mendocino	Manganese	–	Unknown	Occurrence
14	Gravelly Valley	Lake	Manganese, Silica	Chert, Psilomelane, Pyrolusite	Surface / Underground	Past Producer
15	Unnamed Location	Lake	Mercury	–	Underground	Unknown
16	Oberfeld Shale Quarry	Mendocino	Stone, Crushed / Broken	–	Surface	Producer
17	Soda Creek Bar	Lake	Sand and Gravel, Construction	–	Surface	Producer
18	Soda Spring	Lake	Geothermal	–	Geothermal	Occurrence

Source: USGS 2015

3.3.6.10 References

Atwater, T. 1970. Implications of plate tectonics for the Cenozoic tectonic evolution of Western North America. Geological Society of America Bulletin 81: 3,513–536.

Cardwell, G.T. 1965. Geology and Ground Water in Russian River Valley Areas and in Round, Laytonville, and Little Lake Valleys, Sonoma and Mendocino Counties, California. USGS Water Supply Paper 1548.

CDMG (California Division of Mines and Geology). 1995. Earthquake Fault Zones Lake Pillsbury 7.5-Minute Topographic Quadrangle Map. June 1.

DWR (California Department of Water Resources). 2024. Well Completion Report Map Application. Available at: https://gis.water.ca.gov/app/wcr/. Accessed May 2024.

FERC (Federal Energy Regulatory Commission). 1978. Final Environmental Impact Statement for the Potter Valley Project, No. 77-California. December.

Geosyntec Consultants, Inc. (Geosyntec). 2020. Memorandum: Lake Pillsbury and Van Arsdale Reservoir Sediment Characterization. Prepared for California State Coastal Conservancy. April.

Geosyntec Consultants, Inc. (Geosyntec). 2019. Preliminary Environmental Contamination Source Assessment; Lake Pillsbury and Van Arsdale Reservoir, Northern California. Prepared for California State Coastal Conservancy. August.

Holway, R.S. 1911. An extension of the known area of Pleistocene glaciation to the Coast Ranges of California. Bulletin of the American Geographical Society 43(3): 161–70. Published by the American Geographical Society.

Jayko, A.S., M.C. Blake, R.J. McLaughlin, H.N. Ohlin, S.D. Ellen, and H.M. Kelsey. 1989. Reconnaissance geologic map of the Covelo 30- by 60-minute Quadrangle, Northern California: U.S. Geological Survey Miscellaneous Field Studies Map 2001, scale 1:100,000. Available at: www. pubs.er.usgs.gov/publication/mf2001.

Langenheim, V.E., R.C. Jachens, R.L. Morin, and C.A. McCabe. 2007. Preliminary Gravity and Magnetic Data of the Lake Pillsbury Region, Northern Coast Ranges, California. U.S. Geological Survey Open-File Report 2007-1368. Available at: http://pubs.usgs.gov/of/2007/1368.

Lienkaemper, J.J. 2010. Recently Active Races of the Bartlett Springs Fault, California: A Digital Database. U.S. Geological Survey Data Series 541, v1.0. Available at: http://pubs.usgs.gov/ds/541.

Langenheim, V.E., R.J. McLaughlin, and B.L. Melosh. 2024. Integrated Geologic and Geophysical Modeling across the Bartlett Springs fault zone, northern California (USA): Implications for Fault Creep and Regional Structure: Geosphere, v. 20, no. 1, p. 129–151.

Lozos, J.C., R.A. Harris, J.R. Murray, and J.J. Lienkaemper. 2015. Dynamic Rupture Models of Earthquakes of the Bartlett Springs Fault, Northern California. Geophysical Research Letters 42: 4,343–349. June 5. DOI: 10.1002/2015GL063802.

Ohlin, H.N., R.J. McLaughlin, B.C. Moring, and T.L. Sawyer. 2010. Geologic Map of the Bartlett Springs Fault Zone in the Vicinity of Lake Pillsbury and Adjacent Areas of Mendocino, Lake, and Glenn Counties, California. U.S. Geological Survey Open-File Report 2010-1301, scale 1:30,000. Available at: https://pubs.usgs.gov/of/2010/1301.

PG&E (Pacific Gas and Electric Company). 2021. Cape Horn Dam Supporting Technical Information Document, Revision 1, January.

PG&E (Pacific Gas and Electric Company). 2016. Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System, Potter Valley Area Hydro, Lake and Mendocino Counties, California.

USDA (U.S. Department of Agriculture). 1972. Water, Land, and Related Resources, North Coastal Area of California and Portions of Southern Oregon; Appendix No. 2 Sediment Yield and Land Treatment, Klamath, Trinity, and South River Basins; Russian River, Mendocino Coast, and Clear Lake Basins. USDA, River Basin Planning Staff.

USDA (U.S. Department of Agriculture). 1970. Water, Land, and Related Resources, North Coastal Area of California and Portions of Southern Oregon; Appendix No. 1 Sediment Yield and Land Treatment, Eel and Mad River Basins. USDA, River Basin Planning Staff.

USDA-NRCS (USDA Natural Resources Conservation Service). 2016. Soil Survey Geographical Data Base (SSURGO). Available at: https://www.nrcs.usda.gov/resources/data-and-reports/soil-survey-geographic-database-ssurgo.

USGS (U.S. Geological Survey). 2015. Mineral Resources Data System (MRDS). Available at: http://mrdata.usgs.gov/mrds/.

USGS (U.S. Geological Survey). 1922. California Hullville Quadrangle Grid Zone "G."

UC Davis (University of California, Davis). 2024. California Soil Resource Lab: SoilWeb Online Soil Survey. Available at: https://casoilresource.lawr.ucdavis.edu/gmap/.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Figures

List of Maps

List of Acronyms

ac-ft	acre-foot/acre-feet
FERC	Federal Energy Regulatory Commission
ft.	foot/feet
mi.	mile(s)
$mi.^2$	square mile(s)
mm	millimeters
NAVD 88	North American Vertical Datum of 1988
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
$t\ mi.^{-2}\ y^{-1}$	tons per $mi.^2$ per year
TMDL	total maximum daily load
U.S.	United States
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
$yd.^3$	cubic yard(s)

3.3.7 Geomorphology

3.3.7.1 Introduction

This section describes the geomorphic processes in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). The Federal Energy Regulatory Commission (FERC) requires the applicant to provide information regarding regional geomorphology and how it has been affected by the Project. This section is focused on sediment supply to the Project reservoirs and how operation of the Project has altered sediment transport processes and changed channel morphology. For the purposes of this document, the study area includes Lake Pillsbury, its inflowing tributaries, the Eel River downstream to the Eel River estuary, including the Cape Horn Dam and Van Arsdale Reservoir, and the East Branch Russian River from the Potter Valley Powerhouse tailrace downstream to Lake Mendocino (approximately 11 river miles [mi.]).

3.3.7.2 Information Sources

This section was prepared using the following public information sources:

- Planning documents and study reports analyzing the feasibility of removing Scott Dam and Cape Horn Dam (Stillwater Sciences 2021a; Stillwater Sciences 2021b; Stillwater Sciences et al. 2021a; Stillwater Sciences et al. 2021b);
- Stream inventory reports and stream condition inventories (CDFG 1995, 1997, 1998a, 1998b; USFS-MNF 2014, 2015);
- Watershed analysis reports for the Upper Main Eel River and Lake Pillsbury Basin (USFS-MNF 1995, Brooks et al. 1984);
- Lake Pillsbury bathymetric survey reports (PG&E 2016, 2017, 2024);
- Sediment reports for Lake Pillsbury, Van Arsdale Reservoir, and the Eel River Basin (Porterfield and Dunnam 1964; PG&E 2005; Brown and Ritter 1971);
- Upper Main Eel River and tributaries (including Tomki Creek, Outlet Creek, and Lake Pillsbury) total maximum daily loads (TMDLs) for sediment and temperature (United States [U.S.] Environmental Protection Agency [USEPA] 2004);
- North Coast Erosion and Sediment Control Pilot Project, Tomki Creek Watershed (Mendocino County Resource Conservation District 1983);
- Helicopter reconnaissance of Eel River from Scott Dam to Outlet Creek (PG&E 2012); and
- Fisheries study results conducted for the Project in 1980 (VTN 1982).

3.3.7.3 Geomorphic Setting

The Eel River is the third-largest watershed in California, draining 3,684 square miles ($mi.^2$), with a mean annual discharge of 6.5 million acre-feet (ac-ft). Major sub-basins of the Eel River are the Main Eel River (1,477 $mi.^2$), the Middle Fork Eel River (753 $mi.^2$), the North Fork Eel River (283 $mi.^2$), the South Fork Eel River (690 $mi.^2$), and the Van Duzen River (428 $mi.^2$) (see Figure 3.2-2). The Upper Eel River, which is the 78-mi.-long reach of Eel River from its headwaters to just upstream of the confluence with the Middle Fork Eel River, originates on the slopes of Bald Mountain at an elevation of approximately 6,739 feet (ft.) above mean sea level and drains 688 $mi.^2$. From its headwaters, the Eel River flows in a southerly direction for 23 mi. before turning westward and flowing into Lake Pillsbury. The river descends an average of 200 ft. per mi. (3.8 percent) in this reach.

The Eel River (153 $mi.^2$) and Rice Fork (96 $mi.^2$) enter Lake Pillsbury, as do other smaller tributaries including Salmon Creek (16.2 $mi.^2$), Smokehouse Creek (13.9 $mi.^2$), Squaw Valley Creek (8.8 $mi.^2$), Horsepasture Gulch (2.1 $mi.^2$), and Salt Spring Creek (2.2 $mi.^2$). The total drainage area at Scott Dam is 289 $mi.^2$. Downstream of Lake Pillsbury, the Eel River flows 12 mi. westward to Van Arsdale Reservoir, with an average slope of approximately 29 ft. per mi. (0.5 percent). The total drainage area at Cape Horn Dam is 349 $mi.^2$. Downstream from Van Arsdale Reservoir, the Eel River turns northwest, descending an average of 16 ft. per mi. (0.3 percent) to its confluence with the Middle Fork Eel River located 55 mi. downstream (Brown and Ritter 1971). Tomki Creek (64 $mi.^2$) and Outlet Creek (162 $mi.^2$) are major tributaries between Scott Dam and the Middle Fork Eel River confluence. The Eel River flows another 119 mi. to the ocean with a gradient of 7 ft. per mi. (0.14 percent). Three major tributaries, the North Fork Eel, South Fork Eel, and Van Duzan rivers, and numerous smaller tributaries enter along the way.

The Northern Coast Range in the vicinity of the Eel River is predominantly composed of the Franciscan Complex, consisting of three structurally separated belts: the Eastern, Central, and Coastal belts (Jayko et al. 1989). The Central belt, which underlies much of the Eel River watershed between the South Fork Eel River confluence near Weott and the Middle Fork Eel River confluence near Dos Rios, consists of a Late Jurassic to Middle Cretaceous argillaceous mélange matrix encompassing blocks and slabs of sandstone and shale turbidite sequences (McLaughlin et al. 2000). The Eel River canyon dissecting the Central belt between approximately Alderpoint and Dos Rios is especially prone to landslides in the form of large earthflow complexes (Brown and Ritter 1971; Mackey and Roering 2011). Upstream of Dos Rios, the Upper Main Eel River Watershed is underlain by Franciscan terrain, Franciscan schist, and Cretaceous marine rocks. These geologic terrains are generally more stable, with less sediment production than areas downstream of Dos Rios. The portion of the Upper Main Eel River Watershed between Outlet Creek and Cape Horn Dam is most susceptible to mass wasting (Brown and Ritter 1971). Upstream of Cape Horn Dam, unstable areas prone to mass wasting (e.g., landslides and steep inner gorges) constitute 16.4 percent of the watershed area, and soils with a high erosion hazard rating constitute 40.3 percent of the area (USFS-MNF 1995).

Sediment Supply and Load

Sediment Supply

USEPA added the Upper Main Eel River to California's 303(d) impaired water list in 1992 due to elevated sedimentation and temperature. TMDLs for sediment and temperature were established for the Upper Main Eel River in 2004 (USEPA 2004). The TMDL concluded that approximately 13.3 million cubic yards (yd.^{3}) of sediment was delivered to the Upper Eel River between 1940 and 2004, equating to an average annual delivery rate of 302 yd.^{3} per mi.^{2} per year. About 47 percent of the total sediment delivery during the period originated from undifferentiated Franciscan terrain (58 percent of watershed area), and about 25 percent originated from Franciscan schist terrain (21 percent of watershed area). The primary sources of sediment (94 percent of the total delivery) were large erosion features (e.g., shallow debris slides, debris flows, gullies, and streambank erosion) unrelated to earthflows. About 33 percent of the total sediment delivery was related to human disturbance (primarily associated with roads and timber harvest). By comparison, human disturbance as a percent of total sediment delivery was reported as 52 percent in the Lower Eel River watershed (USEPA 2007) and 46 percent in the South Fork Eel River watershed (USEPA 1999), which suggests that the relative impact of management-related sediment delivery is less in the Upper Main Eel River Watershed than elsewhere in the Eel River watershed.

Sediment Load

The Eel River has the highest recorded average suspended sediment load per unit area of any river of its size or larger in the conterminous United States (Lisle 1990). During the 10-year period from 1958 to 1967, the Eel River at Scotia (3,113 mi.^{2}) discharged an average suspended load of about 31,390,000 tons per year (10,084 tons per mi.^{2} per year [t mi.$^{-2}$ y^{-1}]) (Brown and Ritter 1971). The high erosion and sediment transport rates have been attributed to a combination of rapid uplift and tectonic deformation, erosive bedrock, high seasonal rainfall and intense storm events, and anthropogenic disturbance (e.g., forest management, road construction, and agriculture). The Upper Main Eel River above the Middle Fork Eel River confluence (drainage area 1,705 mi.^{2}) contributed about 6.6 percent (2,938 t mi.$^{-2}$ y^{-1}) of the annual suspended load at Scotia during the 1958–1967 period. The upper watershed has a smaller load compared to other parts of the watershed, due primarily to more competent geology, less extensive land use change, and sediment trapping in Lake Pillsbury (see discussion of reservoir sedimentation below).

3.3.7.4 Reservoir Sedimentation

Scott Dam Area

Lake Pillsbury Sediment Volume

Sediment accumulation in Lake Pillsbury reflects sediment supplied from the Upper Main Eel River source area and can be used to estimate average annual sediment delivery. The original 94,400-ac-ft storage capacity of Lake Pillsbury in December 1921 was reduced by 7,620 ac-ft (8.1 percent) by May 1959 (Porterfield and Dunnam 1964). Sediment delivery between December 1921 and May 1959 was about 316,000 t y^{-1} (1,097 t mi.$^{-2}$ y^{-1}), of which 94 percent was deposited within the reservoir (Brown and Ritter 1971). Storage capacity in Lake Pillsbury was further reduced to 80,700 ac-ft in 1984 (Brooks et al. 1984 in USFS-MNF 1995), resulting in a 14.5 percent reduction in the storage capacity since 1921. Sediment delivery between 1959 and 1984 was about 373,200 t y^{-1} (1,296 t $mi.^{-2}$ y^{-1}).

On December 12, 2004, FERC approved PG&E's bathymetric survey plan for Lake Pillsbury required by Article 55 of PG&E's amended license for the Project. The plan specified that PG&E would conduct bathymetric surveys of Lake Pillsbury every 10 years, beginning in 2005. The 2005 bathymetric survey indicated a 20.6 percent reduction in storage capacity since 1921. Sediment delivery between 1984 and 2005 was about 417,000 t y^{-1} (1,448 t $mi.^{-2}$ y^{-1}). Bathymetric surveys of Lake Pillsbury were conducted again in 2015 and 2016, and survey results were submitted to FERC (PG&E 2016, 2017), and in 2023 (PG&E 2024). Table 3.3.7-1 and Figure 3.3.7-1 show the change in the total storage capacity (volume) of Lake Pillsbury over time. The reservoir still has approximately 73 percent of its original storage capacity based on results from the 2023 survey (PG&E 2024). The slight increase in capacity shown between 2005 and 2015–2016 may be the result of improvements in equipment and techniques between the surveys rather than a true reduction in storage capacity.

Table 3.3.7-1. Lake Pillsbury storage capacity over time.

Year	Volume (ac-ft)	% of Original Capacity
1921	94,400	100
1959	86,780	92
1984	80,700	85
2005	74,993	79
2015–2016	76,876	81
2023	68,871	73

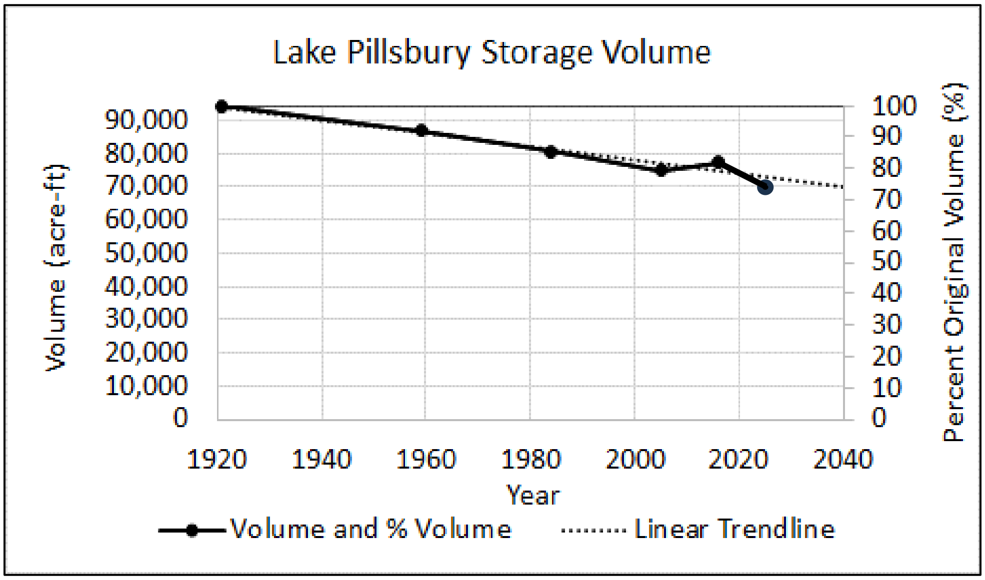


Figure 3.3.7-1. Lake Pillsbury total storage capacity by year.

Stillwater Sciences et al. (2021a) georeferenced a PG&E map with 10-ft. contours from 1922 and compared it with a 2015 bathymetry digital terrain model to estimate the total volume of sediment stored within Lake Pillsbury. The difference in maximum water surface elevation of 1,828.3 ft. (National Geodetic Vertical Datum of 1929 or 1,831.2 ft. North American Vertical Datum of 1988 [NAVD 88]) from both the 1922 and 2015 sources resulted in an estimate of 20.5 million yd.^{3} of stored sediment. Because the 20.5-million-yd.^{3} estimate does not account for sediment storage upstream of the 1922 and 2015 mapping boundaries at the head of the reservoir, this value was rounded up to a final estimated sediment volume of 21 million yd.^{3} within Lake Pillsbury (Stillwater Sciences et al. 2021a). It is estimated that 1.82 million yd.^{3} (about 15 percent) of the 21 million yd.^{3} is deposited in the inundated areas of Salmon/Smokehouse creeks, Squaw Valley Creek, and Horsepasture Gulch (Stillwater Sciences 2021b).

Lake Pillsbury Sediment Texture

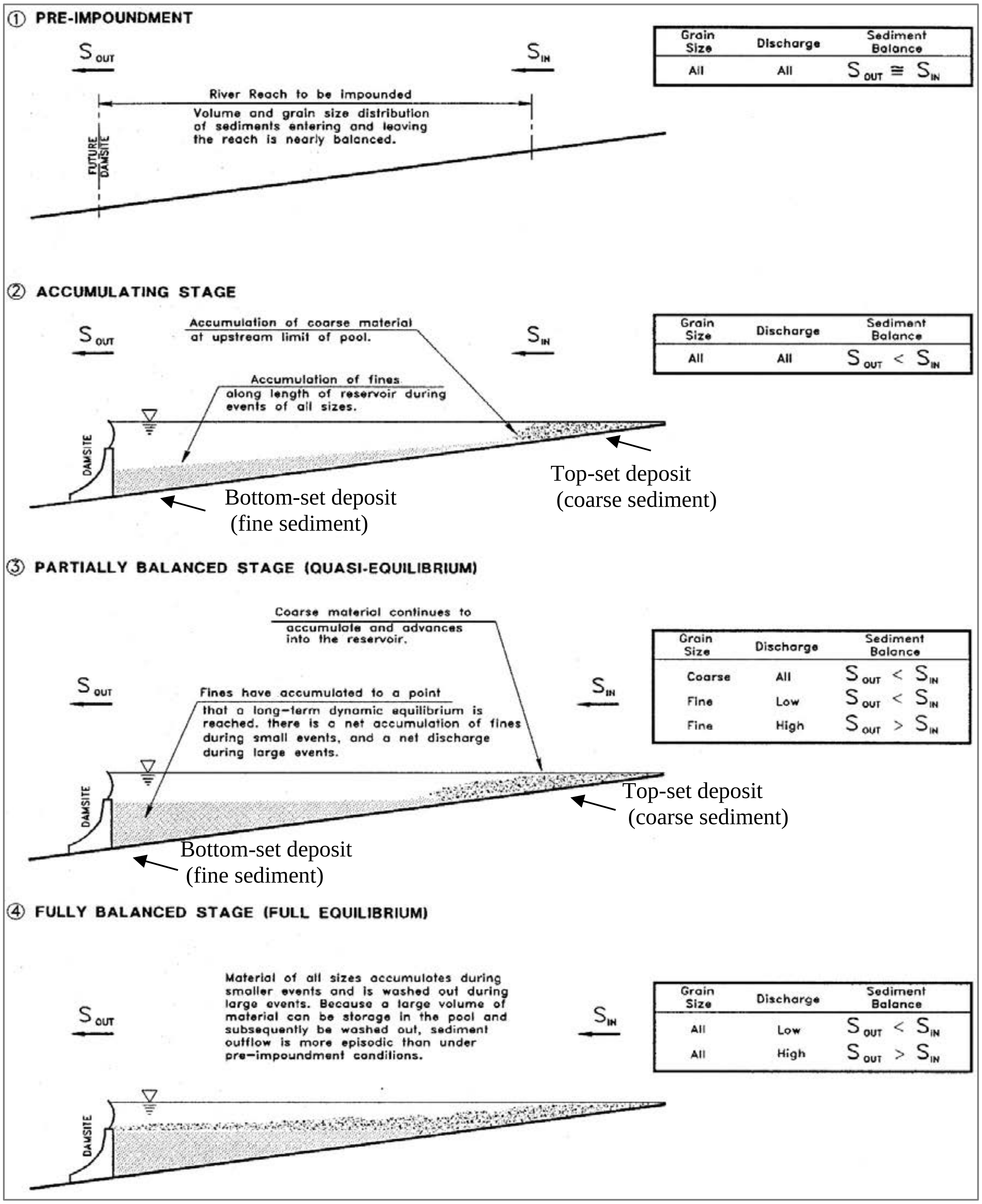
Two primary sources exist for determining the grain size distribution of sediment in Lake Pillsbury: Porterfield and Dunham 1964 and Geosyntec 2020. Porterfield and Dunnam (1964) used sediment density probing and bathymetric survey analysis to conclude that reservoir sedimentation was greatest in the upper reaches of the Eel River and along Rice Fork with observed spatial differences in sediment texture. Relatively coarse sediment deposits 9 to 18 ft. thick occurred in the upper reaches, whereas the downstream portion of the reservoir was a relatively uniform 3- to 5-ft.-thick deposit of predominantly silt and clay (Porterfield and Dunnam 1964, as cited in Geosyntec 2020).

Geosyntec (2020) reported that sediment within Lake Pillsbury is primarily silt and clay (six of nine composite samples had 90 percent or greater silt and clay content and two others exceeded 75 percent). Only one of the samples collected in the mainstem Eel River in the upstream end of the reservoir was predominantly sand and gravel (Geosyntec 2020). Geosyntec (2020) encountered a hard surface at three of its sample sites and attributed this to consolidation of previously deposited sediments. Stillwater Sciences et al. (2021a) noted that the U.S. Geological Survey (USGS) and Geosyntec sediment samples were from shallow cores and neither provided a comprehensive assessment of all accumulated sediment in Lake Pillsbury.

Stillwater Sciences (2021a) estimated that sand made up 34 percent of the 21 million yd.^{3} within Lake Pillsbury, or about 7.1 million yd.^{3} (5.7 million tons). The estimate is based on a 34 percent sand fraction from Porterfield and Dunnam (1964) and an average bulk density of 1,590 pounds/yd.^{3}. Over the 93-year period of Scott Dam operation (1923–2015), the long-term average annual sand supply to Lake Pillsbury is 61,000 tons/year (Stillwater Sciences [2021b]), which based on drainage area translates roughly to 37,500 tons/year from the Eel River and 23,500 tons/year from the Rice Fork.

Based on the assumption that gravel is typically about 5 to 10 percent of total sediment production, which is primarily composed of sand, silt, and clay, Stillwater Sciences (2021b) estimated approximately 2 million yd.^{3} of gravel is deposited in Lake Pillsbury. Importantly, Stillwater Sciences (2021b) also stated that inadequate information exists to reasonably understand the volume and grain size distribution of gravel deposited in Lake Pillsbury because neither USGS nor Geosyntec collected samples from the upper reservoir gravel deposits (top-set deposit) (Figure 3.3.7-2). The gravel deposits are most likely concentrated at least 1 river mi. upstream of Scott Dam on the Rice Fork and 2 river mi. upstream of the dam on the mainstem Eel River (Stillwater Sciences 2021b). As depicted on Figure 3.3.7-2, this spatial trend of relatively coarse top-set sediment deposits primarily occurring in the upper portion of the reservoir and finer sediment deposits (bottom-set) extending farther downstream to the dam at a lower elevation is commonly observed behind dams (Geosyntec 2020).

The remaining portion of sediment in Lake Pillsbury, 11.9 million yd.^{3}, or 56 percent, is assumed to be silt and clay.



Source: PG&E 2005

Figure 3.3.7-2. Stages of reservoir sedimentation development after dam construction.

Cape Horn Dam Area

Van Arsdale Reservoir Sediment Volume

Van Arsdale Reservoir has a surface area of approximately 106 acres at a normal maximum water surface elevation of 1,494.3 ft. The gross storage capacity of Van Arsdale Reservoir was originally 1,457 ac-ft, with a usable capacity of 1,140 ac-ft. Accumulation of sediment over time has resulted in significant loss of reservoir capacity. Based on the most recent bathymetric and topographic surveys conducted in 2002 and 2006, the current reservoir capacity is less than 390 ac-ft, indicating that 1.7 million $yd.^3$ of sediment has accumulated behind the dam (PG&E 2006; McMillen Jacobs Associates 2021).

In response to FERC's concerns about coarse sediment deposition in the vicinity of the intake to the diversion tunnel and associated fish screen at Cape Horn Dam, PG&E evaluated sedimentation in Van Arsdale Reservoir in the early 2000s (PG&E 2005). The study analyzed reservoir sediment characteristics, sediment transport, and estimated sediment yield to the impoundment. Results of the study suggested that the filling of the reservoir with coarse sediment (predominantly) has resulted in a low sediment accumulation (trap) efficiency, with most incoming sediment transported through the impoundment and past Cape Horn Dam. PG&E (2005) reported that the Van Arsdale Reservoir was functioning as a Stage 3 reservoir that was partially balanced (in quasi-equilibrium) but was actively progressing toward a Stage 4 reservoir that is fully balanced (in full equilibrium, sediment in equals sediment out) (Figure 3.3.7-2).

Historically, PG&E dredged the reservoir to maintain storage capacity, but it eventually ceased dredging because of the high cost and frequent deposition of new sediment (Stillwater et al. 2021a). Fine gravel (3 to 6 millimeters [mm]) is transported through the impoundment during annual flow events, and medium gravel (8 to 16 mm) is transported through the reservoir during 2- to 5-year return flows (PG&E 2005). PG&E estimated that minimum coarse sediment deposition rates averaged approximately 5,000 $t\ y^{-1}$ (81 $t\ mi.^2\ y^{-1}$) and minimum total sediment yield (i.e., coarse and fine) to the impoundment ranged from 407 to 814 $t\ mi.^{-2}\ y^{-1}$. These minimum estimates assume that bedload was deposited in the reservoir during high-flow events that occurred during 1993, 1995, 1997, and 1998; reservoir sediment deposits are approximately 10 to 20 percent of the total load and have a density of 1.17 tons per cubic meter; and sediment delivered to the impoundment was supplied from the 98-$mi.^2$ source area downstream of Scott Dam. The report indicated that Soda Creek, located approximately 10 mi. upstream of Cape Horn Dam, is a major source of coarse sediment delivered to Van Arsdale Reservoir. As part of the study, PG&E (2005) evaluated alternatives to managing sedimentation in Van Arsdale Reservoir, including sediment pass-through and submerged flow training structures designed to transport sediment away from the diversion intake structure.

Van Arsdale Reservoir Sediment Texture

The reservoir sediment near the dam is predominantly sand and gravel based on one composite sample collected (Geosyntec 2020). It is possible finer-grained sediment deposits occur directly behind Cape Horn Dam, but sampling of the area was not possible due to access limitations and safety concerns (Geosyntec 2020). Most of the reservoir was noted to have no visible fine sediments but rather a streambed composed of gravel, cobble, and boulders (Geosyntec 2020). The coarseness of the sediment is indicative of the reservoir's small storage area (low trap efficiency) and likely occurs because gravel and finer sediment currently is transported through the reservoir and into the Eel River downstream of Cape Horn Dam (Stillwater Sciences et al. 2021a).

Eel River Sediment Texture

The channel substrate of the Eel River between Cape Horn Dam and Scott Dam has become coarser than pre-dam conditions due to trapping of sediment in Lake Pillsbury and a reduction in supply of finer-grained sediment (Geosyntec 2020).

3.3.7.5 Channel Morphology

Stream channel morphology and sedimentation in the Eel River Watershed is closely linked to stochastic hillslope processes and high-flow events that produce and transport fluvial sediment (Lisle 1982). A December 1964 flood increased the incidence of landsliding and resulted in greatly widened channels (Brown and Ritter 1971; Kelsey 1977) with reduced bar-pool bed topography (Lisle 1982). On the Upper Main Eel River, the 1964 flood increased channel bed elevations by 2 ft. just upstream of the confluence with the Middle Fork Eel River (Brown and Ritter 1971). Tomki Creek widened, lost much of its riparian cover, and lost many deep pools (Mendocino County Resource Conservation District 1983, as cited in USEPA 2004). Aggradation in Soda Creek resulted in a braided channel morphology in the half-mile upstream of its confluence with the Eel River, creating a potential barrier to upstream fish migration during some flows. Channels in the watershed typically recover from these large events over long periods (i.e., decades) of subsequent exposure to smaller discharges that remobilize and sort stored sediment (Janda and Nolan 1979; Kelsey 1980; Lisle 1981, 1990; Nolan and Marron 1985). In some reaches, channel patterns and flood deposits along the higher channel margins may persist until floods of equal or greater magnitude occur (Kelsey 1977; Lisle 1981).

Various approaches have been used to classify the Upper Main Eel River into reaches based on generalized geomorphic characteristics. An instream flow study conducted in 1980 segmented the Upper Main Eel River from the Outlet Creek confluence to Scott Dam into six reach types based on channel form and tributary confluences (VTN 1982). A subsequent instream flow study in 1987 segmented the river between Scott Dam and Outlet Creek into three reaches (Scott Dam to Cape Horn Dam, Cape Horn Dam to Tomki Creek, and Tomki Creek to Outlet Creek) based on hydrologic nodes (Steiner Environmental Consulting 1987). Most recently, the Upper Eel River between Scott Dam and Outlet Creek was broadly characterized into geomorphic reaches based on confinement (i.e., channel and valley widths) and valley landforms (i.e., floodplains, river terraces, alluvial fans, and bedrock controls) (PG&E 2012). The river channel was generally described as occupying a relatively narrow valley with little floodplain development. Six intra-canyon valleys were identified where the channel is locally wider and bordered by terraces and alluvial fans. From upstream to downstream, these intra-canyon valleys include Soda Creek, Lauder Flat, Van Arsdale Reservoir, Heartstorie Camp, Marshalls Cabins, and Emandal Resort.

Little additional information is available to describe past and present channel geomorphic conditions (e.g., morphology and bed particle size) in the main stem and major tributaries of the Upper Main Eel River. The California Department of Fish and Wildlife described physical habitat characteristics in stream inventories for Soda Creek (CDFG 1998a), Benmore Creek (CDFG 1998b), Tomki Creek (CDFG 1997), and Outlet Creek (CDFG 1995). Additional information on general geomorphic conditions in tributary channels is included in the 1995 Watershed Analysis Report for the Upper Main Eel River Watershed (USFS-MNF 1995) and in stream condition inventories conducted by the Mendocino National Forest in Benmore Creek (USFS-MNF 2014 [unpublished data]) and Soda Creek (USFS-MNF 2015 [unpublished data]). PG&E included physical habitat metrics for some channel reaches in its Potter Valley Project Monitoring Program.

Eel River and Tributaries within Lake Pillsbury

The Eel River and its tributaries within Lake Pillsbury are buried under approximately 21 million $yd.^3$ of impounded sediment. The depth of sediment deposition varies throughout Lake Pillsbury.

Mainstem Eel River Upstream of the Rice Fork

Comparison of the 1921 pre-dam contours with 2015 bathymetric data shows much of the mainstem Eel River (i.e., 17,000 ft. upstream of Scott Dam) is buried under approximately 35 ft. of sediment (California Trout et al. 2021). Sediment depth is approximately 10 ft. throughout a 2,000ft.-long reach located 2,000 to 3,000 ft. upstream of Scott Dam.

Rice Fork

Of the historical stream branches entering Lake Pillsbury, the depth of trapped sediment is greatest in Rice Fork. Comparison of the 1921 pre-dam contours with 2015 bathymetric data shows that the historical Rice Fork channel is buried under approximately 50 ft. of mobile sediment in an 11,000-ft.-long reach upstream of Scott Dam (California Trout et al. 2021).

Salmon Creek

The depth of accumulated sediment is lower in the tributaries within the Gravelly Valley[1] portion of Lake Pillsbury than in the mainstem Eel River or Rice Fork. Comparison of the 1921 pre-dam contours with the 2015 bathymetric data shows much of the historical Salmon Creek channel from Scott Dam upstream at least 15,000 ft. is buried under approximately 10 ft. of mobile sediment (California Trout et al. 2021).

Squaw Valley Creek

Comparison of the 1921 pre-dam contours with the 2016 bathymetric data shows that Squaw Valley Creek is buried under approximately 10 ft. of mobile sediment for about 3,500 ft. upstream of its confluence with the mainstem Eel River and under about 10 ft. or less for another 6,000 ft. upstream (Stillwater Sciences 2021b).

[1] The area near the northern shores of Lake Pillsbury.

Horsepasture Gulch

Comparison of the 1921 pre-dam contours with the 2016 bathymetric data shows Horsepasture Gulch is buried under approximately 15 to 20 ft. of mobile sediment for about 1,700 ft. upstream of its confluence with the mainstem Eel River and under about 5 ft. or less for another 1,300 ft. upstream (Stillwater Sciences 2021b).

Eel River – Scott Dam to Cape Horn Dam

Downstream of Scott Dam, the Eel River flows 12 mi. westward to Van Arsdale Reservoir. This reach has three distinct reach breaks. For the first 2.5 mi., the Eel River has a slope of 0.33 percent. The river then becomes steeper for the next 4 mi. with a slope of 0.80 percent. The final 5.5-mi.-long reach has a slope of 0.18 percent. The sediment impounded upstream of Cape Horn Dam reduces the channel slope (based on thalweg elevations from cross-section surveys performed in 2020–2021, as cited in Stillwater Sciences 2021b). Scott Dam includes a 3-ft. by 5-ft. sluice tunnel with a sluice outlet at an approximate elevation of 1,812 ft. (PG&E local datum or 1,733.2 ft. NAVD 88) (McMillen Jacobs Associates 2021). The sluice outlet has not been operable for many years and was abandoned, as it is buried under approximately 8 ft. of silt (McMillen Jacobs Associates 2021). The trapping of sediment behind Scott Dam has reduced the bedload sediment supply from upstream of the dam to the 12-mi.-long reach downstream to Cape Horn Dam. The channel morphology of the 12-mi.-long reach is typical of rivers downstream of large dams that substantially regulate flow and sediment. Channel substrate is coarser than it would be without Scott Dam in place and vegetation is denser, which contributes to confinement of the channel and restriction of channel meandering into pre-dam floodplain areas (Stillwater Sciences et al. 2021b).

Soda Creek, which has a drainage area of 13.5 mi.^{2}, enters from the north approximately 1.1 mi. downstream of Scott Dam. Farther downstream Bucknell Creek, which has a drainage area of 18.2 mi.^{2}, enters the Eel River from the south. The Eel River upstream of Soda Creek has a channel bed dominated by coarse sediment and bars with dense riparian vegetation. These conditions restrict the river's potential to meander within its pre-dam floodplain (Stillwater Sciences et al. 2021b). The input of flow and sediment from Soda Creek creates a more dynamic channel in which the river has large alluvial bars where it is not confined within a narrow canyon. Downstream from Soda Creek, the Eel River enters a canyon that limits opportunities for sediment storage in bars and channel meandering. For approximately the first 5 mi. downstream of Scott Dam, the active channel of the Eel River is about 170 ft. wide. It then narrows to approximately 100 ft. from 5 to 11 mi. downstream of Scott Dam before widening to about 180 ft. as the river enters Van Arsdale Reservoir (based on observations from 2016 and 2017 aerial photographs, as cited in Stillwater Sciences et al. 2021b). Near Van Arsdale Reservoir, the canyon widens, sediment transport potential decreases, and sediment from Soda Creek and other tributaries deposits to form bars that can be colonized by vegetation to create floodplain areas (Stillwater Sciences et al. 2021b).

Eel River – Cape Horn Dam to Middle Fork Eel River

Downstream from Van Arsdale Reservoir, the Eel River turns northwest, descending for about 37 mi. at an average channel slope of 0.29 percent to its confluence with the Middle Fork Eel River (based on thalweg elevations from cross-section surveys performed in 2020–2021, as cited in Stillwater Sciences 2021b). Stillwater Sciences et al. (2021b) hypothesized that most sediment supplied to the Eel River by Soda Creek and other smaller tributaries is transported through Van Arsdale Reservoir and over Cape Horn Dam based on the presence of active bars on the reservoir's inside bend and concrete abrasion on the east side of the dam. The input of additional sources of sediment to the Eel River downstream of Cape Horn Dam from tributaries creates an alluvial bar morphology in the river. Although riparian encroachment is observed at some locations, the river transitions to lightly vegetated, or vegetation-free, bars formed of boulders, cobbles, and gravel with increased sediment mobility (Stillwater Sciences et al. 2021b).

The effect of flow regulation and reduced sediment supply at Scott Dam on the geomorphic processes of the Eel River diminishes with distance downstream from the dam. With the flow and sediment contributions from Tomki Creek (4 mi. downstream of Cape Horn Dam and 16 mi. downstream of Scott Dam) and other tributary inputs, such as Outlet Creek (30 mi. downstream of Cape Horn Dam), the signature of Scott Dam on the Eel River's geomorphic processes is difficult to detect downstream of the confluence with the Middle Fork Eel River (Stillwater Sciences et al. 2021b). The active channel width of the Eel River in the Cape Horn Dam to Middle Fork Eel River reach typically ranges between 100 and 250 ft. (based on observations from 2016 and 2017 aerial photographs, as cited in Stillwater Sciences 2021b).

Eel River – Middle Fork Eel River to Estuary

The Middle Fork Eel River drains 753 mi.^{2}, which is a larger drainage area than that of the Upper Eel River upstream of the Middle Fork (688 mi.^{2}). It is a major contributor of flow and sediment to the mainstem Eel River that further diminishes the effects of flow regulation and sediment supply reduction created by Cape Horn Dam and Scott Dam.

Several other principal tributaries enter the mainstem Eel River before it reaches the ocean. The North Fork Eel River (283 mi.^{2}) enters approximately 22.9 mi. downstream of the Middle Fork, and the average channel slope in the Middle Fork to North Fork Eel River reach is about 0.24 percent. About 40.5 mi. upstream of the estuary, the South Fork Eel River (690 mi.^{2}) enters the Eel River, and 27.6 mi. farther downstream is the confluence with the Van Duzen River (428 mi.^{2}), located about 12.9 mi. upstream of the estuary. The average slope in the North Fork to South Fork Eel River reach is 0.15 percent, in the South Fork to Van Duzen River reach the average slope is 0.07 percent, and from the Van Duzen River to the ocean the average slope is 0.05 percent.

The exceptionally high sediment yield from the watershed (Lisle 1990) is apparent in the extensive sediment bars that are nearly continuous along the river channel. At low flow, the river is typically a single-thread (sometimes multi-thread as the channel splits around mid-channel bars), sinuous channel flowing between extensive bedload deposits. Minimal riparian vegetation is observed along the low-flow channel or on sediment bars, which indicates a dynamic channel with frequently occurring floods capable of scouring riparian vegetation.

About 11 mi. upstream of the estuary, the Eel River transitions into an “anabranching” channel pattern characterized by multiple channel threads flowing around vegetated islands, and the slope of the river is nearly flat as it enters the Pacific Ocean.

Recent Restoration Projects

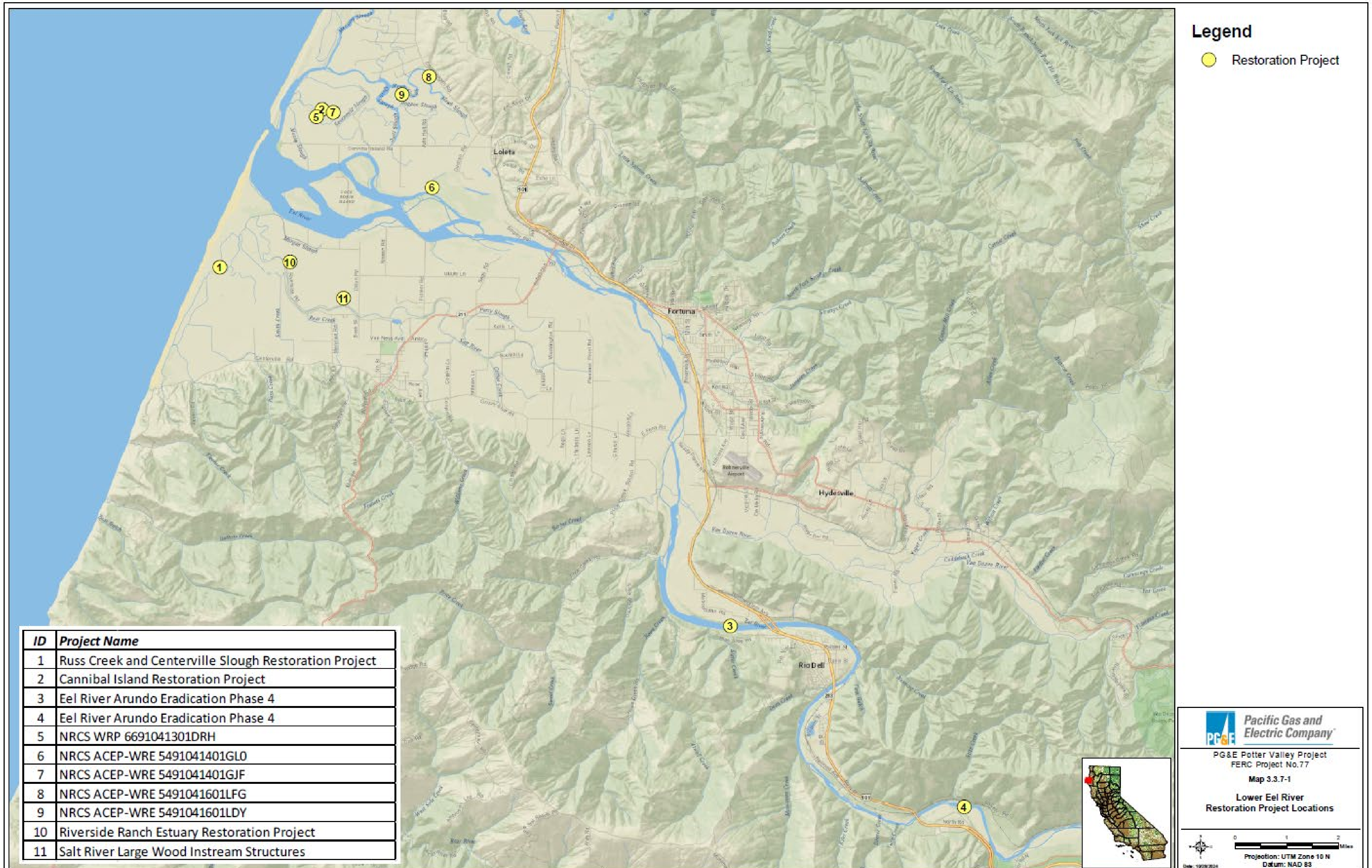
Several restoration projects have recently been implemented in the lower Eel River. Table 3.3.7-2 lists these recent projects and provides a summary of the restoration activities, size of the project, and implementation years. The locations of these projects, identified by the Site No. in Table 3.3.7-2, are shown on Map 3.3.7-1.

Table 3.3.7-2. Recent restoration projects in the lower Eel River.

Site No.	Project Title	Lead Agency	Description	Size/ Length	Start and Completion Date/Phase
1	Russ Creek and Centerville Slough Restoration Project	Humboldt County Resource Conservation District	Project actions include re-establishing the Centerville Slough tidal system by constructing a new Centerville Slough main channel and tributaries subject to full tidal influence, re-establishing hydraulic connectivity between Centerville Slough and upland stream channels, and constructing a system of set-back levees to protect adjacent agricultural lands from tidal flooding, Eel River flooding, and dune overwash.	1,480 acres	Planning and design; implementation to occur in 2025 with bulk in 2026; 2024–2027
2	Cannibal Island Restoration Project	CDFW	The project will enhance and reconnect full tidal exchange to approximately 500 acres of former tidal marsh habitat to promote recovery and maintenance of tidal marsh habitats and resiliency to sea level rise.	795 acres	Implementation 2024/2025–ongoing
3	Eel River Arundo Eradication Phase 4	CDFW	Project actions include eradication of *Arundo donax* from at least eight sites in the Eel River Watershed.	37 mi.	2025–2027
4	NRCS WRP 6691041301DRH	Central Valley Joint Venture	Restored and re-established palustrine wetlands and emergent freshwater marsh.	135.9 acres	2018

Site No.	Project Title	Lead Agency	Description	Size/ Length	Start and Completion Date/Phase
5	NRCS ACEP-WRE 5491041401GL0	Central Valley Joint Venture	Restored and re-established palustrine wetlands and emergent freshwater marsh, including the acquisition of marsh and forested riparian land.	47.62 acres	2020
6	NRCS ACEP-WRE 5491041401GJF	Central Valley Joint Venture	Restored and re-established palustrine wetlands and emergent freshwater marsh.	83.73 acres	2018
7	NRCS ACEP-WRE 5491041601LFG	Central Valley Joint Venture	Restored and re-established palustrine wetlands and emergent freshwater marsh. Three acres of the project included upland acquisition for preservation and protection of the restored wetland and marsh.	15.72 acres	2020
8	NRCS ACEP-WRE 5491041601LDY	Central Valley Joint Venture	Restored and re-established palustrine wetlands and emergent freshwater marsh, including acquisition of land.	267.6 acres	2018–2023
9	Riverside Ranch Estuary Restoration Project	Humboldt County Resource Conservation District	Project activities included two levee breaches in the Salt River to restore estuarine juvenile rearing habitat restored via two levee breaches in the Salt River. Project created approximately 19,800 linear ft. of interior slough channel and 50 acres of estuarine area.	268 acres	2011–2014
10	Salt River Large Wood Instream Structures	Humboldt County Resource Conservation District	Installed 16 large wood structures along 2,200 ft. of the newly constructed Salt River channel.	0.42 mi.	2005–2016

Sources: OPR 2024; CWMW 2024; NOAA 2024; California Trout et al. 2024



ID	Project Name
1	Russ Creek and Centerville Slough Restoration Project
2	Cannibal Island Restoration Project
3	Eel River Arundo Eradication Phase 4
4	Eel River Arundo Eradication Phase 4
5	NRCS WRP 6691041301DRH
6	NRCS ACEP-WRE 5491041401GL0
7	NRCS ACEP-WRE 5491041401GJF
8	NRCS ACEP-WRE 5491041601LFG
9	NRCS ACEP-WRE 5491041601LDY
10	Riverside Ranch Estuary Restoration Project
11	Salt River Large Wood Instream Structures

Map 3.3.7-1. Lower Eel River restoration project locations.

This Page Intentionally Left Blank

East Branch Russian River

Limited information is available to describe geomorphic processes in the East Branch Russian River. In general, the river is of low gradient, dropping 24 ft./mi. (0.4 percent gradient) over the approximately 11-mi. reach from the Potter Valley Powerhouse to the ordinary high-water mark of Lake Mendocino. Along this reach, the river runs through the agriculture lands of Potter Valley before entering an open canyon area above Lake Mendocino. A series of check dams within the valley portion of this reach were installed historically to control stream erosion/downcutting. Through Potter Valley, riparian habitat occurs as a corridor approximately 100 to 200 ft. wide.

3.3.7.6 Lake Pillsbury Shoreline Erosion

Lake Pillsbury's historical normal maximum water surface elevation was 1,910 ft. (PG&E local datum). Due to concerns over seismic instability of Scott Dam, as an interim risk reduction measure, PG&E established a 10-ft. restriction on the maximum reservoir operating level. The maximum water surface elevation under existing conditions with the variance is 1,900 ft. (FERC 2023).

Steeper shorelines around Lake Pillsbury consisting of unconsolidated soils and/or sediments typically experience varying degrees of erosion related to the tractive force of wind-generated or boat-generated waves. PG&E typically uses an elevation of 1,861.7 ft. (10,000 ac-ft) as a minimum storage level to avoid the potential for bank failure, plugging of the needle valve outlet, and release of sediment-laden water to downstream reaches.

3.3.7.7 References

Brooks, J., E. Ekman, B. Faust, and A. James. 1984. Lake Pillsbury basin watershed analysis. Prepared under the direction of the California Department of Fish and Game, Region III; the Mendocino National Forest; the Mendocino County Fish and Wildlife Advisory Committee; Pacific Gas and Electric Company; and the Sonoma County Water Agency.

Brown, W., and J. Ritter. 1971. Sediment transport and turbidity in the Eel River basin, California. U.S. Geological Survey Water-Supply Paper 1986.

California Trout, Stillwater Sciences, Applied River Sciences, and University of California, Berkeley. 2024. Eel River restoration and conservation plan—Phase 1: Planning—of the Eel River Watershed Restoration and Conservation Program. Prepared for California Department of Fish and Wildlife. June 2024. Available at: https://caltrout.org/wp-content/uploads/2024/06/Eel-River-RC-Plan_Final.pdf.

California Trout, Stillwater Sciences, McBain Associates, and McMillen Jacobs Associates. 2021. Potter Valley Project technical studies: Lake Pillsbury sediment management discussion. PowerPoint presentation, January 14, 2021.

CDFG (California Department of Fish and Game). 1998a. Salmon and Steelhead Restoration and Enhancement Program, stream inventory report: Soda Creek.

CDFG (California Department of Fish and Game). 1998b. Salmon and Steelhead Restoration and Enhancement Program, stream inventory report: Benmore Creek.

CDFG (California Department of Fish and Game). 1997. Salmon and Steelhead Restoration and Enhancement Program, stream inventory report: Tomki Creek.

CDFG (California Department of Fish and Game). 1995. Salmon and Steelhead Restoration and Enhancement Program, stream inventory report: Outlet Creek.

CWMW (California Wetlands Monitoring Workgroup). 2024. EcoAtlas. Accessed October 2024. Available at: https://www.ecoatlas.org.

FERC (Federal Energy Regulatory Commission). 2023. Order approving temporary variance of flow requirements under License Article 52. FERC Project No. 77-313, California. October.

Geosyntec. 2020. Sediment investigation report – Lake Pillsbury and Van Arsdale Reservoir, Northern California. Prepared for California State Coastal Conservancy.

Janda, R.J., and K.M. Nolan. 1979. Stream sediment discharge in northwestern California. In Guidebook for a Field Trip to Observe Natural and Management-Related Erosion in Franciscan Terrane of Northwestern California, Cordilleran Section of the Geological Society of America, pp. IV-I to IV-27.

Jayko, A.S., M.C. Blake, R.J. McLaughlin, H.N. Ohlin, S.D. Ellen, and H.M. Kelsey. 1989. Reconnaissance geologic map of the Covelo 30- by 60-minute quadrangle, Northern California. U.S. Geological Survey Miscellaneous Field Investigation Map MF-2001, scale 1:100,000.

Kelsey, H.M. 1980. A sediment budget and an analysis of geomorphic process in the Van Duzen River basin, north coastal California, 1941–1975: summary. Geological Society of America Bulletin Part I, Vol. 91: 190–195.

Kelsey, H.M. 1977. Landsliding, channel changes, sediment yield and land use in the Van Duzen River Basin, North Coastal California, 1941–1975. Ph.D. thesis, University of California, Santa Cruz.

Lisle, T.E. 1990. The Eel River, Northwestern California: high sediment yields from a dynamic landscape. In Surface Water Hydrology, Vol. O-1. The Geology of North America, M.G. Wolman and H.G. Riggs, eds., pp. 311–314. Geological Society of America.

Lisle, T. 1982. Effects of aggradation and degradation on riffle-pool morphology in natural gravel channels, northwestern California. Water Resources Research 18(6): 1,643–1,651.

Lisle, T. 1981. Recovery of aggraded stream channels at gaging stations in Northern California and Southern Oregon. T.R.H. Davis and A.J. Pearce, eds. Erosion and sediment transport in Pacific Rim steeplands. Symposium, International Association of Hydrological Sciences – International Association of Hydrogeologists (IAHS-AISH) Publication 132: 189–200.

Mackey, B., and J. Roering. 2011. Sediment yield, spatial characteristics, and the long-term evolution of active earthflows determined from airborne LiDAR and historical aerial photographs, Eel River, California. Geological Society of America Bulletin. Available at: https://doi.org/10.1130/B30306.1.

McLaughlin, R.J., S.D. Ellen, M.C. Blake, Jr., A.S. Jayko, W.P. Irwin, K.R. Aalto, G.A. Carver, and S.H. Clarke, Jr. 2000. Geology of the Cape Mendocino, Eureka, Garberville, and Southwestern part of the Hayfork 30- x 60-Minute Quadrangles and Adjacent Offshore Area, Northern California.

McMillen Jacobs Associates. 2021. Scott Dam and Cape Horn Dam removal alternatives. Prepared for Two-Basin Solution Partners.

Mendocino County Resource Conservation District. 1983. North Coast Erosion and Sediment Control Pilot Project, Tomki Creek Watershed. Ukiah, CA. December.

NOAA (National Oceanic and Atmospheric Administration). 2024. PCSRF Projects Map. Pacific Coastal Salmon Recovery Fund Database. Available at: https://www.webapps.nwfsc.noaa.gov/apex/f?p=309:18.

Nolan, K., and D. Marron. 1985. Contrast in stream-channel response to major storms in two mountainous areas of California. Geology 13: 135–138.

OPR (California Governor's Office of Planning and Research). 2024. CEQAnet Web Portal. Available at: https://ceqanet.opr.ca.gov/.

PG&E (Pacific Gas and Electric Company). 2024. Lake Pillsbury bathymetric survey – 2023. Prepared by PG&E Applied Technology Services. Report No. 026.11-24.3.

PG&E (Pacific Gas and Electric Company). 2017. Lake Pillsbury bathymetric survey – 2016. Prepared by PG&E Applied Technology Services. Report No. 026.11-16.3.

PG&E (Pacific Gas and Electric Company). 2016. Lake Pillsbury bathymetric survey – 2015. Prepared by PG&E Applied Technology Services. Report No. 026.11-16.1.

PG&E (Pacific Gas and Electric Company). 2012. Eel River development survey, February 9, 2012. Helicopter reconnaissance of Eel River from Scott Dam to Outlet Creek. PG&E Geosciences Division. Memorandum produced by W. Page. May 4.

PG&E (Pacific Gas and Electric Company). 2006. Van Arsdale Reservoir bathymetric survey, Technical, and Land Services.

PG&E (Pacific Gas and Electric Company). 2005. Potter Valley Project (FERC No. 77) Van Arsdale Reservoir sedimentation investigation report. Report No. 026.11-05.17. August.

Porterfield, G., and C. Dunnam. 1964. Sedimentation of Lake Pillsbury, Lake County, California. Geological Survey Water-Supply Paper 1619-EE. April.

Steiner Environmental Consulting. 1987. Potter Valley Project Monitoring Program (FERC No. 77, Article 39) effects of operations on Upper Eel River anadromous salmonids, 1985–1986 Progress Report. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

Stillwater Sciences. 2021a. Analyses of fine sediment erosion following the proposed Scott Dam removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

Stillwater Sciences. 2021b. Analyses and preliminary modeling of sediment transport following the proposed Scott Dam removal, Eel River, California. Technical Memorandum. Prepared for Two-Basin Solution Partners. November.

Stillwater Sciences, McBain Associates, McMillen Jacobs Associates, M.Cubed, Princeton Hydro, and Geosyntec Consultants. 2021a. Potter Valley Project feasibility study: capital improvements. Prepared by Stillwater Sciences and McBain Associates, Arcata, California; McMillen Jacobs Associates, Boise, Idaho; M.Cubed, Davis, California; Princeton Hydro, South Glastonbury, Connecticut; and Geosyntec Consultants, Oakland, California, for the Potter Valley Project Planning Agreement Parties.

Stillwater Sciences, McBain Associates, McMillen Jacobs Associates, M.Cubed, Princeton Hydro, and Geosyntec Consultants. 2021b. Potter Valley Project feasibility study: potential ecosystem and fisheries responses to project alternatives. Working draft technical memorandum prepared by Stillwater Sciences and McBain Associates, Arcata, California; McMillen Jacobs Associates, Boise, Idaho; M.Cubed, Davis, California; Princeton Hydro, South Glastonbury, Connecticut; and Geosyntec Consultants, Oakland, California, for the Potter Valley Project Planning Agreement Parties.

USEPA (U.S. Environmental Protection Agency). 2007. Lower Eel Rive total maximum daily loads for sediment and temperature. Prepared by USEPA, Region IX, San Francisco, CA.

USEPA (U.S. Environmental Protection Agency). 2004. Upper Main Eel River and tributaries (including Tomki Creek, Outlet Creek, and Lake Pillsbury) total maximum daily loads for sediment and temperature. Prepared by USEPA, Region IX, San Francisco, CA.

USEPA (U.S. Environmental Protection Agency). 1999. South Fork Eel River total maximum daily loads for sediment and temperature. Prepared by USEPA, Region IX, San Francisco, CA.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 2015. Unpublished stream condition inventory conducted by the Mendocino National Forest in Soda Creek.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 2014. Unpublished stream condition inventory conducted the by Mendocino National Forest in Benmore Creek.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 1995. Watershed analysis report for the Upper Main Eel River. May.

VTN. 1982. Potter Valley Project (FERC No. 77) fisheries study. Final report vols. I and II. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

CAL FIRE	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CLERC	Clear Lake Environmental Research Center
FERC	Federal Energy Regulatory Commission
FRAP	Fire and Resource Assessment Program
ft.	foot/feet
LRMP	Land and Resource Management Plan
MA	management area
mi.	mile(s)
MNF	Mendocino National Forest
MOA	memoranda of agreement
NFSL	National Forest System Lands
NPS	National Park Service
NTS	National Trails System
OHV	off-highway vehicle
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
Stewardship Council	Pacific Forest and Watershed Lands Stewardship Council
SUA	special use authorization
USFS	U.S. Forest Service
W&SR	Wild and Scenic Rivers

3.3.8 Land Use

3.3.8.1 Introduction

This section describes the existing land uses in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). This section first provides setting information for each of the four Study Regions: (1) Scott Dam Area, (2) Cape Horn Dam Area, (3) Eel River Watershed, and (4) Russian River Watershed. The setting section is followed by a summary of the pertinent land management plans and policies that govern land uses within and adjacent to the Federal Energy Regulatory Commission (FERC) Project boundary. A discussion of wildfire history and fuel management practices is provided at the end of this section. The FERC regulations require the applicant to provide information regarding both land use and recreation. A description of recreation resources is provided in Section 3.3.9. Potential environmental effects related to land use are addressed in Sections 3.4.1.9 and 3.5.1.9.

3.3.8.2 Information Sources

This section was prepared primarily using the following public information sources:

- California Department of Transportation's (Caltrans') Scenic Highway Mapping System (Caltrans 2024);
- California Department of Fish and Wildlife (CDFW) Designated Wild and Heritage Trout Waters (CDFW 2024);
- Lake County General Plan (Lake County 2008);
- Mendocino County General Plan (Mendocino County 2020);
- National Wild and Scenic Rivers (W&SR) System website (National Wild and Scenic Rivers System 2024);
- U.S. Census Bureau population data (Census Bureau 2024);
- U.S. Forest Service (USFS), Mendocino National Forest (MNF) Land and Resource Management Plan (LRMP) (USFS-MNF 1995);
- USFS-MNF's Motor Vehicle Use Map, South Central Map and Insets (USFS-MNF 2017); and
- Wilderness.net – Snow Mountain Wilderness (Wilderness Connect 2024).

3.3.8.3 Scott Dam Area

The Scott Dam Area includes Scott Dam, Lake Pillsbury, and the surrounding recreation facilities. Lake Pillsbury, the main storage reservoir for the Project, is formed behind Scott Dam, located on the Eel River in Lake County. According to U.S. Census Bureau population estimates, the population of Lake County was 68,024 based on the 2022 American Community Survey (U.S. Census Bureau 2024).

Scott Dam is a concrete structure that spans the width of the Eel River, with a maximum height of 130 feet (ft.) and a total length of 805 ft. Most of the land submerged below the high water mark by Lake Pillsbury is owned by PG&E. However, most of the land surrounding Lake Pillsbury is public land managed by MNF. With a surface area of approximately 2,225 acres under normal operating conditions and 29 mi. of shoreline (PG&E 2015), Lake Pillsbury is the largest body of water in the MNF. Lake Pillsbury provides a variety of reservoir-based recreation opportunities such as boating, windsurfing, fishing, and swimming.

The Scott Dam Area can be accessed from the south via Elk Mountain Road (County Road 301, Forest Service Road M1), from the west via Eel River Road (Forest Service Road M8), and from the northeast via Forest Service Road M6. The area is also accessible from the north via a dirt road called Hull Mountain Road (Forest Service Road M1) and other designated dirt roads that are part of the USFS transportation system. A gravel landing strip on the north end of Lake Pillsbury, operated by USFS but open to the general public, enables access by air.

County Land Use Designation

According to the Lake County General Plan land use designation map, nearly the entire north half of Lake County, including most of the Scott Dam Area and land along the Eel River, is designated as either "public land" or "agriculture." The land along the north end of Lake Pillsbury is designated as "resource conservation."

3.3.8.4 Cape Horn Dam Area

The Cape Horn Dam Area includes Cape Horn Dam and Van Arsdale Reservoir. Water captured and stored in Lake Pillsbury is released into the Eel River and then captured again in Van Arsdale Reservoir, an approximately 65-acre reservoir formed behind Cape Horn Dam, located within Mendocino County. Water captured in Van Arsdale Reservoir is then conveyed through a tunnel and penstock system to the Potter Valley Powerhouse, which is located in the Russian River Watershed and discussed below. According to U.S. Census Bureau population estimates, the population of Mendocino County was 91,145 based on the 2022 American Community Survey (U.S. Census Bureau 2024).

The Eel River between Lake Pillsbury and Van Arsdale Reservoir flows primarily through PG&E-owned property and intermittent parcels of public land managed by the MNF (see Map 3.2-4). Van Arsdale Reservoir is located outside the boundaries of the MNF. The land underlying and surrounding Van Arsdale Reservoir is primarily owned by PG&E and other private parties. Van Arsdale Reservoir is primarily accessible via East Side Potter Valley Road/Eel River Road.

County Land Use Designation

According to the Mendocino County land use policy map, nearly the entire county is designated as "forest land," "range land," or "public land." Van Arsdale Reservoir, the Potter Valley Powerhouse, and associated conveyance facilities are located in an area designated as "public service." According to the general plan, the public service classification is "applied to lands presently being used for major public service facilities and to land appropriately reserved for expansion or construction of new public service facilities" (Mendocino County 2020). Residential use in areas classified as public service is limited to a single caretaker dwelling per ownership.

3.3.8.5 Eel River Watershed

The Eel River Watershed is located entirely in the Northern Coast Range and is characterized by steep and heavily forested terrain, with minimal development. It covers a large area of Lake County, Mendocino County, Glenn County, Humboldt County, and Trinity County. The Eel River Watershed and sub-watersheds are described in detail in Section 3.2 and graphically depicted on Map 3.2-2. The Project dams and reservoirs are located toward the upper end of the Eel River Watershed.

Downstream of Van Arsdale Reservoir, the Eel River runs through privately owned land. Therefore, public access and development opportunities along the Eel River downstream of Van Arsdale Reservoir are limited. Beginning 100 yards downstream of Cape Horn Dam to its mouth near Fortuna, the Eel River and its four main tributaries (Middle Fork Eel, North Fork Eel, South Fork Eel, and Van Duzen River) are designated as W&SR, reflecting the relatively undeveloped nature of the watershed.

3.3.8.6 Russian River Watershed

Water captured in Van Arsdale Reservoir is diverted and conveyed to the Potter Valley Powerhouse, which is located in the Russian River Watershed, just north of a predominately agricultural community known as Potter Valley (Map 3.2-1). The powerhouse building is a steel-frame structure approximately 101 ft. long by 53 ft. wide, containing three generating units. The three generating units discharge into individual concrete channels, joining into a common channel approximately 60 ft. downstream of the powerhouse. The Potter Valley Powerhouse Switchyard is located adjacent to the powerhouse. After generating power, water is discharged via canal into the East Branch Russian River or into irrigation canals used by the Potter Valley Irrigation District to provide irrigation water to farmers in the Potter Valley. Per the Mendocino County General Plan, most of Potter Valley is classified as "agriculture 40ac," a designation that supports agricultural land uses in the valley.

The Russian River Watershed is less than half the size of the Eel River Watershed and drains an area of approximately 1,484 $mi.^2$. The Russian River Watershed extends within portions of Lake County, Mendocino County, and Sonoma County. The watershed is rural in character and features year-round river flow and hilly or mountainous terrain in the upper reaches. Irrigated agriculture, including orchards and vineyards, are found in the Project vicinity.

Releases from the powerhouse are a source of water in the East Branch Russian River and for local water users. The water discharged to the East Branch Russian River is captured in Lake Mendocino, which is administered by the U.S. Army Corps of Engineers for flood protection but also stores water used by the Sonoma County Water Agency.

3.3.8.7 Land Use and Management in the Project Vicinity

The primary Project facilities and land ownership are shown on Map 3.2-4. A list of the Project facilities in the Scott Dam Area is provided in Table 2-1, and a list of the Project facilities in the Cape Horn Dam Area is provided in Table 2-2.

Land use and management activities on private land in the Scott Dam Area and Cape Horn Dam Area must be consistent with land management objectives and policies outlined in the Lake County General Plan (Lake County 2008), the Mendocino County General Plan (Mendocino County 2020), and related county ordinances. In addition, the Scott Dam Area, including Lake Pillsbury, is within the boundaries of the MNF. Therefore, land use and management within the Scott Dam Area must be consistent with the goals, direction, and prescriptions contained in the MNF LRMP. An overview of the Lake County General Plan, the Mendocino General Plan, and the MNF LRMP is provided in the following subsections.

Lake County General Plan and Ordinances

The Lake County General Plan was adopted in 2008 and provides a framework to guide long-term management of natural resources and development in Lake County. The general plan includes a land use designation map, which defines allowable land uses throughout the county. As noted previously, most of the area surrounding Lake Pillsbury and along the Eel River is designated as either “public land” or “agriculture,” and the land along the north end of Lake Pillsbury is designated as “resource conservation.” Section 3.0 of the general plan addresses population density and building intensity standards for each of these land use designations. Generally, these three designations allow for very low development densities. For example, the standard residential density for areas with an “agriculture” designation is one dwelling unit per 40 acres, and the standard residential density for areas with a “resource conservation” designation is one dwelling unit per 20 to 40 acres. Residential density standards for public land are not specified. Development on private land in the Scott Dam Area must conform to these standards.

Activities on private land and waters in the Project vicinity are also subject to various Lake County codes and ordinances, including the following ordinance that specifically pertains to the Project:

> *Section 15-5.2. (Ord. No. 452, § 1, 1963). No person shall operate or permit to be operated any motorboat in excess of five (5) nautical miles per hour in …. (a) All that portion of the Eel River tributary to Lake Pillsbury, lying southerly of the south line of the north half of the north half of Section 19, Township 18 North, Range 9 West, M.D.B.&M.*

In addition, all water bodies in Lake County, including Lake Pillsbury, are subject to the provisions of Lake County’s Invasive Mussel Prevention Program.

Mendocino County General Plan and Ordinances

The Mendocino County General Plan was adopted in 2009, and several elements of the plan were updated in 2020 (Development Element and Resource Element) and 2021 (Coastal Element). The general plan provides a framework to guide long-term management of natural resources and development within Mendocino County. The Mendocino County General Plan includes a land use policy map, which classifies allowable land uses throughout the county. According to the land use policy map, the Cape Horn Dam Area, including Van Arsdale Reservoir, the Potter Valley Powerhouse, and associated conveyance facilities, are located in an area designated as "public service." Most of Potter Valley is classified as "agriculture 40ac," a designation that supports agricultural land uses in the valley.

Aside from the general ordinances that are applicable throughout Mendocino County, the Mendocino County Code of Ordinances does not appear to contain any provisions specific to Van Arsdale Reservoir or the Project facilities.

Mendocino National Forest Land and Resource Management Plan

The Scott Dam Area is located within the boundaries of the MNF. The MNF manages public lands under its jurisdiction in accordance with the MNF LRMP. The MNF LRMP was adopted in 1995 and amended in 2007 after the Snow Mountain Wilderness Area (located within the MNF) was expanded in 2006 under the Northern California Coastal Wild Heritage Wilderness Act of 2006. Among other things, the LRMP establishes "the management direction and associated long-range goals and objectives for the MNF" (USFS-MNF 1995). The LRMP includes goals, objectives, direction, and prescriptions used to guide land management activities within the MNF, with respect to desired existing and future conditions.

The MNF is divided into 43 management areas (MAs), which are defined by various factors, including administrative boundaries, watershed boundaries, and special areas. In addition to containing general forest-wide management direction, the LRMP contains specific management direction for each MA. The Scott Dam Area lies within MA #11 – Lake Pillsbury. Management direction for this MA outlined in the LRMP is identified below:

- Manage all bald eagle nest sites as recommended in the Pacific Bald Eagle Recovery Plan and the Lake Pillsbury Bald Eagle Habitat Management Plan.
- Analyze and coordinate the development, management, and use of the Lake Pillsbury Basin.
- Emphasize providing quality water-oriented recreation opportunities in a manner consistent with the protection of bald eagles. Expand opportunities in response to anticipated demand. Coordinate all expansion with PG&E and FERC.
- Where applicable to National Forest System Lands (NFSL), implement watershed improvements identified by the Lake Pillsbury Basin Sediment Task Force to control sediment inflow to Lake Pillsbury. Also undertake improvements identified in the Forest Watershed Improvement Needs inventory.
- Emphasize stabilizing serpentine areas along the shoreline as well as the banks of the Eel River and the Rice Fork of the Eel River at their inlets to the reservoir to help reduce turbidity.

- Reduce conflicts between off-highway vehicle (OHV) users and other recreationists through trail designation, administrative controls, and revision of the forest OHV plan.
- Concentrate efforts to inform users about resource protection, fire prevention, and campground regulations. Prioritize law enforcement efforts in this area.
- Analyze opportunities for the development of watchable wildlife areas and wildlife habitat interpretation for the public.
- Provide surfaced road access from Van Arsdale Reservoir to Lake Pillsbury.
- Evaluate the potential effects of use and expansion of the air strip on bald eagles. If found compatible, locate a qualified permittee to operate the airstrip within 5 years or close it to further use.
- Maintain the permit for a private resort on the reservoir for boat rentals, fuel, and so on. Continue to permit the summer home tract.
- Do not issue a grazing permit in this area.

Additional information regarding this MA and the two contiguous MAs (MA #10 – Ericson Ridge and MA #12 – Skeleton Glade) is available in the1995 LRMP and 2007-01 LRMP Amendment.

Mendocino National Forest Travel Management

The use of roads and trails on NFSL is managed by the MNF. All roads and trails in the MNF that are designated as open to motorized travel are shown on motor vehicle use maps, which also display uses allowed by vehicle class (highway-legal vehicles, vehicles less than 50 inches wide, and motorcycles) and seasonal allowances. Routes not shown on the motor vehicle use maps are not open to public motor vehicle travel. Road use designations in the Project vicinity are shown on MNF Motor Vehicle Use Map, South Central Map and Insets (USFS-MNF 2017).

3.3.8.8 Land Use and Management within the FERC Project Boundary

The Project and the locations of the primary Project facilities are shown on Map 3.2-3, and jurisdictional boundaries are shown on Map 3.2-4. Within the current FERC Project boundary, land ownership consists of:

- PG&E = 2,307.47 acres
- USFS = 1,143.15 acres
- Private = 36.13 acres

Land use within the FERC Project boundary is primarily hydropower generation and recreation, both of which are managed in accordance with the articles and conditions outlined in the Project license, associated management plans, and several special use authorizations (SUAs) and memoranda of agreement (MOAs) between PG&E and the MNF.

As described in Section 3.3.9, a variety of recreation facilities, including campgrounds, day-use areas, boat docks, resorts, and recreation residences are present in the vicinity of the Project, both within and outside the FERC Project boundary, with the Lake Pillsbury area being the most heavily developed. Most of the land inundated by Lake Pillsbury is owned by PG&E. Therefore, Lake County, not the MNF, is responsible for regulating boating, fishing, and other watersports recreation on the reservoir (USFS-MNF 1995). The MNF manages land use on the NFSL that surrounds the lake.

All commercial recreation facilities and recreation residences located on PG&E-owned land are operated under lease or license agreements and/or permits issued by PG&E. All recreation facilities located on public lands managed by the MNF operate under permits or SUAs issued by the MNF. In both cases, the permits and authorizations include provisions and restrictions intended to balance commercial business needs and the rights of private residents with public recreation needs and environmental resource protection.

Existing Shoreline Buffer Zones

The FERC Project boundary provides a buffer zone around the Project reservoirs. These buffer zones help licensees ensure public access to the reservoirs' shorelines and waters and help protect the environmental, recreation, and aesthetic values of the Project reservoirs and their shorelines. Except for areas near Project infrastructure, where public access is restricted for safety and security reasons, PG&E does not limit access to Van Arsdale Reservoir or Lake Pillsbury.

Existing Shoreline Management Policies

There is no shoreline management plan for the Project. Non-Project uses and occupancy of Project shorelines are addressed through long-term leases or license agreements between PG&E and private parties who own land adjacent to Lake Pillsbury. Table 3.3.8-1 lists existing leases and licenses PG&E has issued (as of May 20, 2024) for non-Project use and occupancy of Project lands within the FERC Project boundary, grouped by geographic area.

Table 3.3.8-1. Existing leases/licenses issued by PG&E for non-Project uses within the FERC Project boundary, Lake County (Lake Pillsbury area).

ID Number	Area	Use	Lessee/Licensee
2418-10-10018	Lake Pillsbury-West Shore	Campground	Lake Pillsbury Resort
2418-10-10014	Lake Pillsbury-West Shore	Campground and Boat Dock	Westshore Campers Association
2418-10-0203	Lake Pillsbury-East Shore	Log Booms	Lake Pillsbury Homesite Association
2418-10-0254	Lake Pillsbury-East Shore	Boat Docks	Lake Pillsbury Homesite Association
2418-10-0302	Lake Pillsbury-East Shore	Boat Ramp Facility	Lake Pillsbury Homesite Association
2418-10-0256	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner

ID Number	Area	Use	Lessee/Licensee
2418-10-0183	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-10003	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-10008	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0197	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-10016	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-10015	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0181	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0182	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0186	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0194	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0188	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-10003	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0202	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-0190	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2418-10-10006	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2417-11-0285	Powerhouse	Grazing/Agriculture	Private Property Owner
2417-11-0283	Powerhouse	Weather Station	U.S. Army Corps of Engineers
2418-11-0057	Van Arsdale Dam Area	Use of Existing PG&E House	State of California
2418-11-0232	Trout Creek Campground	Memorial Plaque	California Department of Forestry and Fire Protection
2418-10-10004	Lake Pillsbury-Rice Fork Area	Boat Dock	Private Property Owner
2417-11-0178	Powerhouse	Weather Station	National Oceanic and Atmospheric Administration

Note: The names of individual lessee/licensees and private property owners are not shown for privacy reasons.

3.3.8.9 Specially Designated Areas

Specially designated areas in the vicinity of the Project are summarized below.

National Wild and Scenic River System

Project facilities are not located on river segments identified as eligible or suitable for inclusion in the National W&SR System. However, the Eel River from 100 yards downstream of Cape Horn Dam to its mouth and its four main tributaries (North Fork, South Fork, Middle Fork, and Van Duzen rivers) include segments designated as National W&SR. The Eel River and its tributaries were included in the National W&SR System in 1981 and together include 97 miles (mi.) of river that are classified as "wild," 28 mi. of river that are classified as "scenic," and 273 mi. of river that are classified as "recreational" (National W&SR System 2024). These segments are managed by Bureau of Land Management, California Resources Agency, Round Valley Indian Reservation, and USFS, depending upon jurisdiction. See Section 3.3.10 for additional detail regarding the Eel River's W&SR designations.

State-Protected River Segments

Project facilities are not located on river or stream segments designated as protected by the State of California. However, segments of the Eel River and its tributaries included in the National W&SR System are also included in the California W&SR System and are protected under the California Wild and Scenic Rivers Act by Public Resources Code §§ 5093.50-5093.70. Neither the Eel River and its tributaries nor the Russian River and its tributaries are designated as "wild trout waters" or "heritage trout waters" by CDFW (CDFW 2024).

National Trails System

The National Trails System (NTS) was established in 2009 under the National Trails System Act. It is composed of national recreation trails, scenic trails, historic trails, and connecting trails, all managed by the National Park Service (NPS). The NPS NTS database indicates there are no designated NTS trails in the vicinity of the Project (NPS 2024). The nearest NTS trails are located east of the Coast Range and end in the northern Central Valley.

Scenic Byways/Highways

The Caltrans Scenic Highway Mapping System indicates no officially designated, or eligible, state or county scenic highways are in the Project vicinity. In addition, there are no designated or eligible national scenic byways in the Project vicinity (Caltrans 2024).

Wilderness Areas

The Project is not located within a designated wilderness area. The nearest wilderness area is the Snow Mountain Wilderness Area, 60,299 acres of land managed by the MNF, located approximately 10 to 15 miles east of Lake Pillsbury (Wilderness Connect 2024). The Eel River bisects the western portion of the wilderness area before it enters Lake Pillsbury.

Regionally or Nationally Important Recreation Areas

With the exception of the specially designated areas discussed above, no nationally or regionally important recreation areas are in the Project vicinity. Developed recreation opportunities in the vicinity of the Project, as described further in Section 3.3.9, are concentrated around Lake Pillsbury and nearby in the MNF and at Lake Mendocino.

3.3.8.10 PG&E Land Conservation Commitment

PG&E worked with the Pacific Forest and Watershed Lands Stewardship Council (Stewardship Council) to fulfill its commitment related to a 2003 bankruptcy settlement (Stewardship Council 2024). The Project facilities lie within the Stewardship Council's Eel River Planning Unit. The bankruptcy settlement agreement requires that conservation easements include an express reservation of PG&E's right for continued operation and maintenance of hydroelectric facilities and associated water delivery facilities as well as PG&E's unequivocal ability to comply with any FERC license, FERC license renewal, or other regulatory requirements.

Standard FERC licenses require licensees to obtain and hold the interests in lands and other property necessary to operate their licensed projects and to obtain prior FERC permission to sell, lease, or otherwise dispose of such interest. PG&E requested and received approval from FERC to convey conservation easements over lands within the FERC Project boundaries. Additionally, PG&E requested and received approval from the California Public Utilities Commission prior to the transfer of ownership and/or conservation easements.

Land conservation transactions in the vicinity of the Project include the following (Stewardship Council 2024):

- A conservation easement for 5,660 acres of PG&E-owned land, of which approximately 2,234 acres are within the FERC Project boundary, was recorded on June 28, 2022, to permanently protect beneficial public values on lands owned by PG&E at the Eel River Planning Unit. The conservation easement is held by Mendocino Land Trust.
- The donation of 907 acres at the Eel River Planning Unit to USFS and the establishment of a conservation covenant to be held by Sierra Nevada Conservancy were finalized on October 21, 2021.
- The donation of 879 acres at the Eel River #1 (Trout Creek) property and Eel River #2 (Alder Creek) property to the Potter Valley Tribe and the establishment of a conservation easement held by Mendocino Land Trust were finalized on July 24, 2019.

3.3.8.11 Fire History, Fuels Management, and Fire Suppression

The Project is situated in a remote and sparsely populated area of the state, dominated by dense forests and prone to wildfires. Like other forested parts of the state, large wildfires have occurred in the Project vicinity. Major fires that have occurred in the Project vicinity since the mid-1900s are shown on Map 3.3.8-1, grouped by decade. This map is based on geographic information system data published by California Department of Forestry and Fire Protection (CAL FIRE) as part of the Fire and Resource Assessment Program (CAL FIRE 2024).

Wildfires occurring between 1920 and 2022 within 1 mi. of a Project facility are listed in Table 3.3.8-2. The August Complex Fire, which began on August 15, 2020, as a result of a lightning strike, is the largest fire to have occurred within 1 mi. of the Project facilities and is the largest wildfire in California since record-keeping began (USFS 2021). That fire burned approximately 1,032,700 acres north of Lake Pillsbury, extending into portions of Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake, and Colusa counties.

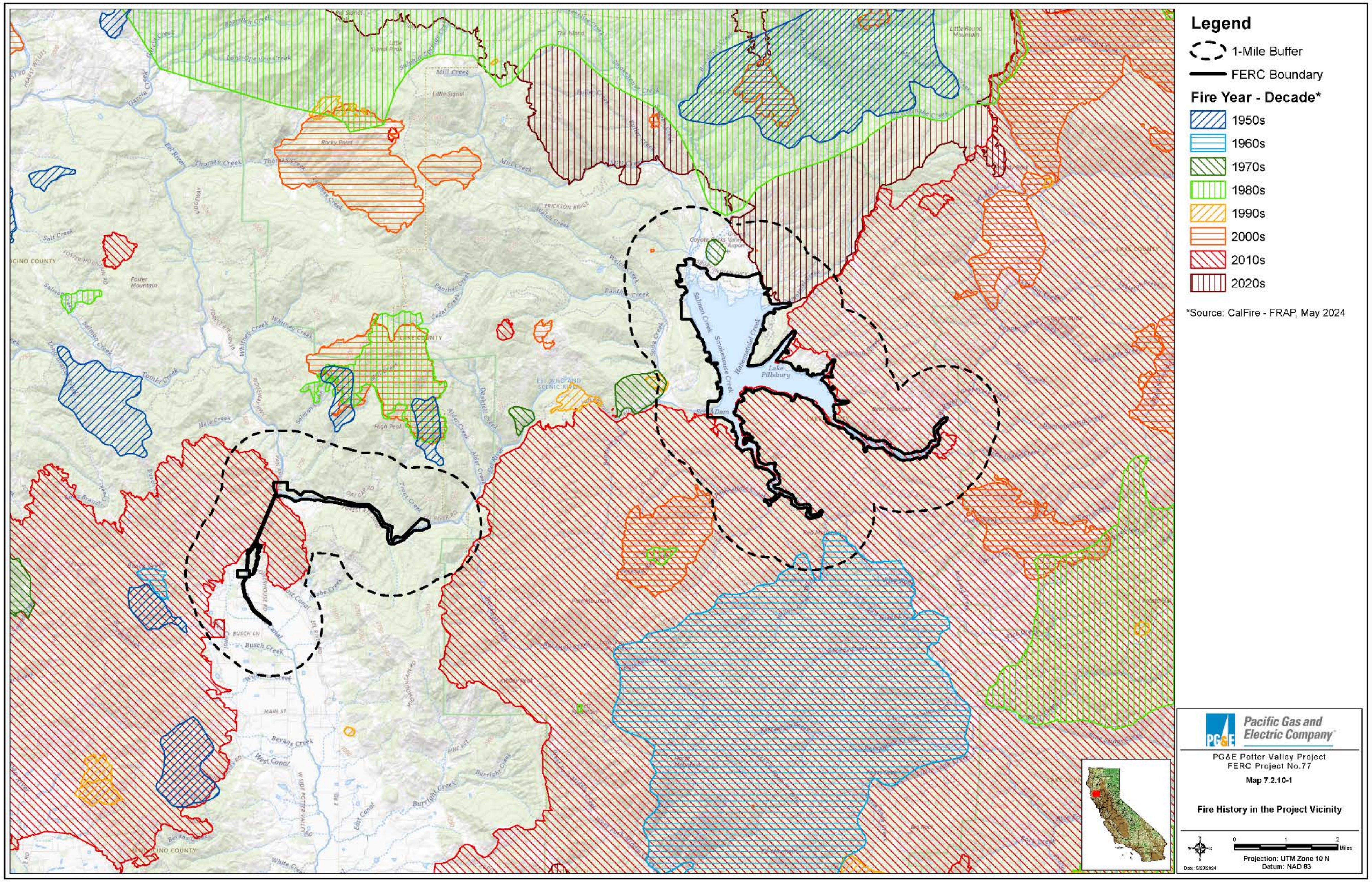
Table 3.3.8-2. Wildfires within 1 mile of Project facilities (1920 through 2022).

Fire Name	Fire Decade	Start Date	Containment Date	Acres Burned	Cause*
-	Unknown	N/A	N/A	769	Unknown/Unidentified
Boardman Ridge	1920	N/A	N/A	1,812	Miscellaneous
Pine Mtn	1930	N/A	N/A	1,741	Unknown/Unidentified
Salmon Creek	1930	N/A	N/A	8,049	Debris
Boardman	1940	N/A	N/A	19,510	Equipment Use
Jordan Flat	1940	N/A	N/A	11,797	Equipment Use
Ukiah Pine	1950	09/26/1954	N/A	319	Unknown/Unidentified
Round	1960	08/06/1966	N/A	20,964	Campfire
Benmore	1970	09/05/1971	09/05/1971	375	Campfire
Gravely	1970	07/14/1973	07/14/1973	83	Arson
Mendenhall	1980	09/01/1987	09/16/1987	65,468	Lightning
Soda II	1990	08/11/1998	08/13/1998	55	Arson
Ericson	2000	09/02/2003	09/04/2003	1.7	Lightning
Gravelly	2000	09/02/2003	09/03/2003	0.1	Lightning
Deer	2000	08/08/2005	08/17/2005	1,720	Equipment Use
Back	2000	06/20/2008	06/28/2008	1,566	Lightning
Skeleton	2010	09/11/2017	09/17/2017	88	Lightning
Redwood Valley	2010	10/07/2017	10/24/2017	36,523	Unknown/Unidentified
Ranch	2010	07/26/2018	09/18/2018	410,202	Miscellaneous
August Complex	2020	08/15/2020	11/10/2020	1,032,700	Lightning

Source: CAL FIRE 2024

* Information does not specify differences between "Miscellaneous" and "Unknown/Unidentified."

This Page Intentionally Left Blank



Map 3.3.8-1. Fire history in the Project vicinity.

This Page Intentionally Left Blank

Fire Prevention and Suppression

In general, fire prevention and fuels management in the Project vicinity are the responsibility of USFS, CAL FIRE, and Lake and Mendocino counties. PG&E actively implements measures to prevent fires on Project lands and to help suppress fires, if necessary, in accordance with Article 27 from the FERC license and various internal PG&E standards, including the following:

- EMER-4102S (formerly TD-1464S) - Preventing and Mitigating Fires While Performing PG&E Work, which includes specific procedures that staff must implement when conducting utility work.
- ENV-8008P-01 - Preventing and Mitigating Wildfire at PG&E Managed Recreation Areas, which governs operation and maintenance procedures and public use and PG&E recreation facilities.

PG&E implements various measures to reduce fire risk, including actively maintaining vegetation in proximity to Project facilities in accordance with Article 27. All fire prevention measures are carried out in accordance with relevant state laws and regulations, including:

- Public Resources Code 4292;
- Public Resources Code 4293;
- General Order 95; and
- North American Electric Reliability Council Standard FAC-003-100.

PG&E keeps basic fire suppression equipment in all company vehicles and at many Project facilities. Fire suppression equipment includes fire extinguishers and hand tools such as shovels, picks, Pulaski tools, mattocks, and McLeod rakes. Additional equipment for special projects is described in Project-specific fire plans developed in coordination with USFS. In addition, motorized equipment and vehicles have spark arrestors, preventing unintended fire ignition due to sparks.

In the event of a large wildfire in the region, water from Lake Pillsbury is drafted for wildfire suppression. Lake Pillsbury has provided a water resource to both state and federal firefighting agencies in recent years to combat wildfires in the region and serves as a water resource for firefighting operations. The land surrounding Lake Pillsbury is Federal Responsibility Area, and therefore under the jurisdiction of the USFS. CAL FIRE coordinates with the USFS and assists on incidents that threaten State Responsibility Area, or when requested by the USFS. The USFS consistently uses Lake Pillsbury and water downstream of Scott Dam to fight wildfires in the area (Moore 2023). Lake Pillsbury was used by both MNF and CAL FIRE in the recent past for incident response, including for the Mendocino Complex Fire in 2018 and the August Complex Fire in 2020 (Moore 2023, Tyler 2023). Water usage data from Lake Pillsbury were not collected by CAL FIRE from the recent Mendocino Complex and August Complex fires because it was a public source of water and, therefore, tracking was not required (Tyler 2023).

CAL FIRE uses all available water sources when responding to incidents in the greater Lake County region, including Lake Pillsbury and Clear Lake (Tyler 2023). Clear Lake is a much larger body of water and offers a more central location for use on incidents throughout the region (Tyler 2023). CAL FIRE recently expanded its aerial firefighting capabilities using the S-70i CAL FIRE FireHawk helicopter, which allows for larger amounts of water to be drawn from Clear Lake and delivered more quickly to incidents within the region (Tyler 2023). The MNF will continue critical wildfire risk reduction projects in the area, including prescribed fire when conditions permit (Moore 2023).

To reinforce PG&E’s dedication to mitigating wildfire threats in California, they awarded a $500,000 grant in 2024 to the Clear Lake Environmental Research Center (CLERC). PG&E’s grant partners include the Northshore Fire Protection District, Lake County Fire Chiefs Association, California Fire Chiefs Association, Gordon and Betty Moore Foundation, and USDA Forest Service. This grant marks the inception of PG&E’s Holistic Wildfire Safety Collaborative in Lake County, a region known for its high wildfire risk and vulnerable communities.

The grant provides financial support, innovative technology, and sustainable practices, focusing on three core areas:

1. Lake County Fire Resilience: In partnership with CLERC, PG&E is bolstering the Northshore Fire Protection District's Hogback Ridge Fuels Crew. This initiative is crucial in enhancing local fire-fighting capabilities and community safety.

2. Dynamic Fire Pathways Analysis: The grant supports the development of XyloPlan, an advanced tool in wildfire science. XyloPlan is instrumental in mapping wildfire pathways, thus informing strategic planning for Lake County’s Community Wildfire Protection Plan. Using artificial intelligence, XyloPlan’s Fire Pathways identifies risks, creates simulations and gauges a wildfire’s route through a mapping platform that measures and maps out weather, topography and vegetation that can become fuel for fire. The data represent a combination of satellite images and field observations assembled by the USFS. Fire agencies can examine results from XyloPlan’s Fire Pathways to determine where can be most effective to reduce fire danger.

3. Biomass Utilization: Embracing innovative technology, the Carbonator project transforms wood waste into biochar, a climate-positive substance. This not only addresses wildfire risks but also aids in agricultural productivity and environmental regeneration.

This grant demonstrates how PG&E's commitment goes beyond traditional utility roles. In the face of challenges posed by climate change, historic droughts, and escalating wildfire risks, PG&E pledges that “all catastrophic wildfires shall stop.” This commitment extends to a holistic approach, encompassing proactive, science-based, and community-focused strategies to protect our environment and communities.

3.3.8.12 References

CAL FIRE (California Department of Forestry and Fire Protection). 2024. California fire perimeters. Available at: https://calfire-forestry.maps.arcgis.com/apps/mapviewer/index.html?layers=e3802d2abf8741a187e73a9db49d68fe. Accessed May 2024.

Caltrans (California Department of Transportation). 2024. California state scenic highways. Available at: https://dot.ca.gov/programs/design/lap-landscape-architecture-and-community-livability/lap-liv-i-scenic-highways.

CDFW (California Department of Fish and Wildlife). 2024. Designated wild and heritage trout waters. Available at: https://wildlife.ca.gov/Fishing/Inland/Trout-Waters.

Lake County. 2008. Lake County General Plan. September. Available at: https://www.lakecountyca.gov/554/Lake-County-General-Plan.

Mendocino County. 2020. Mendocino county general plan, development element. Available at: https://www.mendocinocounty.gov/home/showpublisheddocument/54479/638055061911270000.

Moore, R. 2023. Comment of Randy Moore, USDA Fire Chief regarding Pacific Gas and Electric Company's license surrender application for the Scott Dam, part of the Potter Valley Project, P-77. Submitted to Willie L. Phillips, Federal Energy Regulatory Commission, October 5, 2023. FERC e-library Accession No. 20231006-4000. Available at: https://elibrary.ferc.gov/eLibrary/filelist?accession_num=20231006-4000.

NPS (National Park Service). 2024. National Trails System. Available at: https://www.nps.gov/subjects/nationaltrailssystem/index.htm.

National W&SR System (National Wild and Scenic Rivers System). 2024. National Wild and Scenic Rivers System. Available at: www.rivers.gov/rivers.

PG&E (Pacific Gas and Electric Company). 2015. Supporting technical information document for Cape Horn Dam, Van Arsdale Reservoir. Part 12D independent consultant five-year safety inspection report.

Stewardship Council (Pacific Forest and Watershed Lands Stewardship Council). 2024. Eel River. Available at: https://www.stewardshipcouncil.online/eel.

Tyler, J. 2023. Comments of Joe Tyler, CAL Fire Chief regarding Pacific Gas and Electric Company's license surrender application for the Scott Dam, part of the Potter Valley Project, P-77. Submitted to Willie L. Phillips, Federal Energy Regulatory Commission, October 5, 2023. FERC e-library Accession No. 20231006-4000. Available at: https://elibrary.ferc.gov/eLibrary/filelist?accession_num=20231006-4000.

U.S. Census Bureau. 2024. Population data. Available at: https://www.census.gov/topics/population.html.

USFS (U.S. Forest Service). 2021. August Complex restoration. Available at: https://www.fs.usda.gov/detail/mendocino/home/?cid=FSEPRD860382.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 2017. Motor vehicle use map, south central map and insets. Available at: www.fs.usda.gov/detailfull/mendocino/maps-pubs.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 1995. Mendocino National Forest Land and Resource Management Plan (LRMP). February. Available at: https://www.fs.usda.gov/detailfull/mendocino/landmanagement?cid=FSBDEV3_004518.

Wilderness Connect. 2024. Snow Mountain wilderness. Available at: https://wilderness.net/visit-wilderness/?ID=559.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

ATVs	All-Terrain Vehicles
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Parks and Recreation
CFR	Code of Federal Regulations
cfs	cubic feet per second
EBRR	East Branch Russian River
FERC	Federal Energy Regulatory Commission
LRMP	Land and Resource Management Plan
MA	Management Area
mi.	mile(s)
$mi.^2$	square miles
MNF	Mendocino National Forest
NFSL	National Forest System Lands
NPS	National Park Service
NTS	National Trails System
NVUM	National Visitor Use Monitoring
OHV	off-highway vehicle
PAOT	persons at one time
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SPOA	Survey on Public Opinions and Attitudes on Outdoor Recreation in California
USFS	U.S. Forest Service

3.3.9 Recreation Resources

3.3.9.1 Introduction

This section describes the recreational resources in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). Setting information is presented for the following four Project regions (see Map 3.3.9-1): (1) Scott Dam Area, (2) Cape Horn Dam Area, (3) Eel River Watershed, and (4) Russian River Watershed (limited to the East Branch Russian River, upstream of Lake Mendocino).

This section provides general information about the recreation resources and opportunities in the vicinity of the Project and specific information about recreation opportunities and facilities associated with the Project. Land use within and adjacent to the Federal Energy Regulatory Commission (FERC) Project boundary, including specially designated areas, is discussed in Sections 3.3.8. Potential environmental effects related to recreation are addressed in Sections 3.4.1.10 and 3.5.1.10.

3.3.9.2 Information Sources

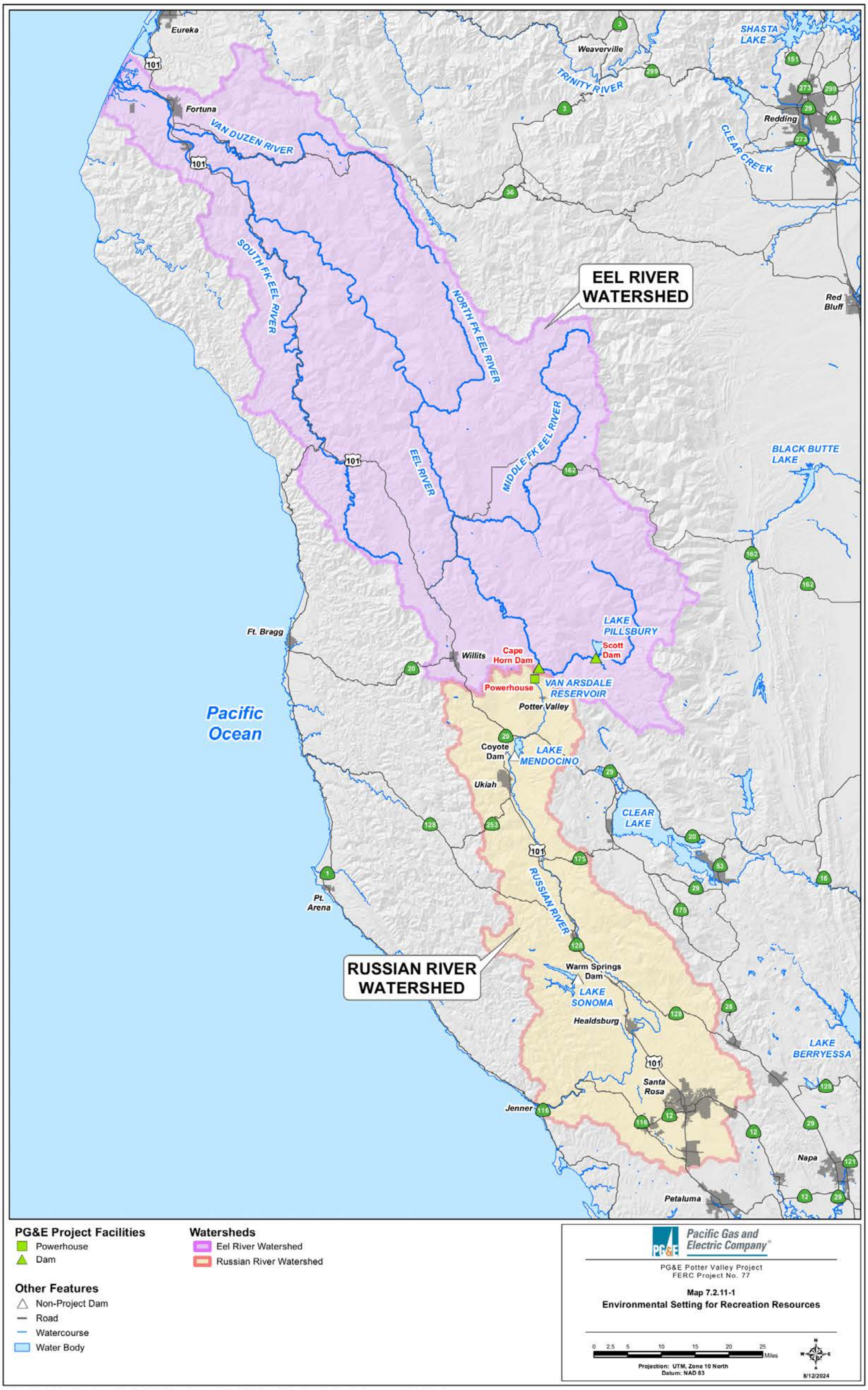
This section was prepared primarily using the following information sources:

- 2021 *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) (California Department of Parks and Recreation [CDPR] 2021);
- California Creeks whitewater boating web guide (Tuthill 2024);
- Camava Campground Use Data 2018 to 2023 (Camava 2024);
- FERC's 2024 *List of Comprehensive Plans* (FERC 2024);
- Form 80 recreation use reports for 2002, 2008, and 2014 (PG&E 2003, 2009, 2015);
- Survey on Public Opinions and Attitudes on Outdoor Recreation in California (SPOA) 2012, Complete Findings (CDPR 2014); and
- U.S. Forest Service (USFS), Mendocino National Forest (MNF) – Land and Resource Management Plan (LRMP) (USFS-MNF 1995).

3.3.9.3 Scott Dam Area

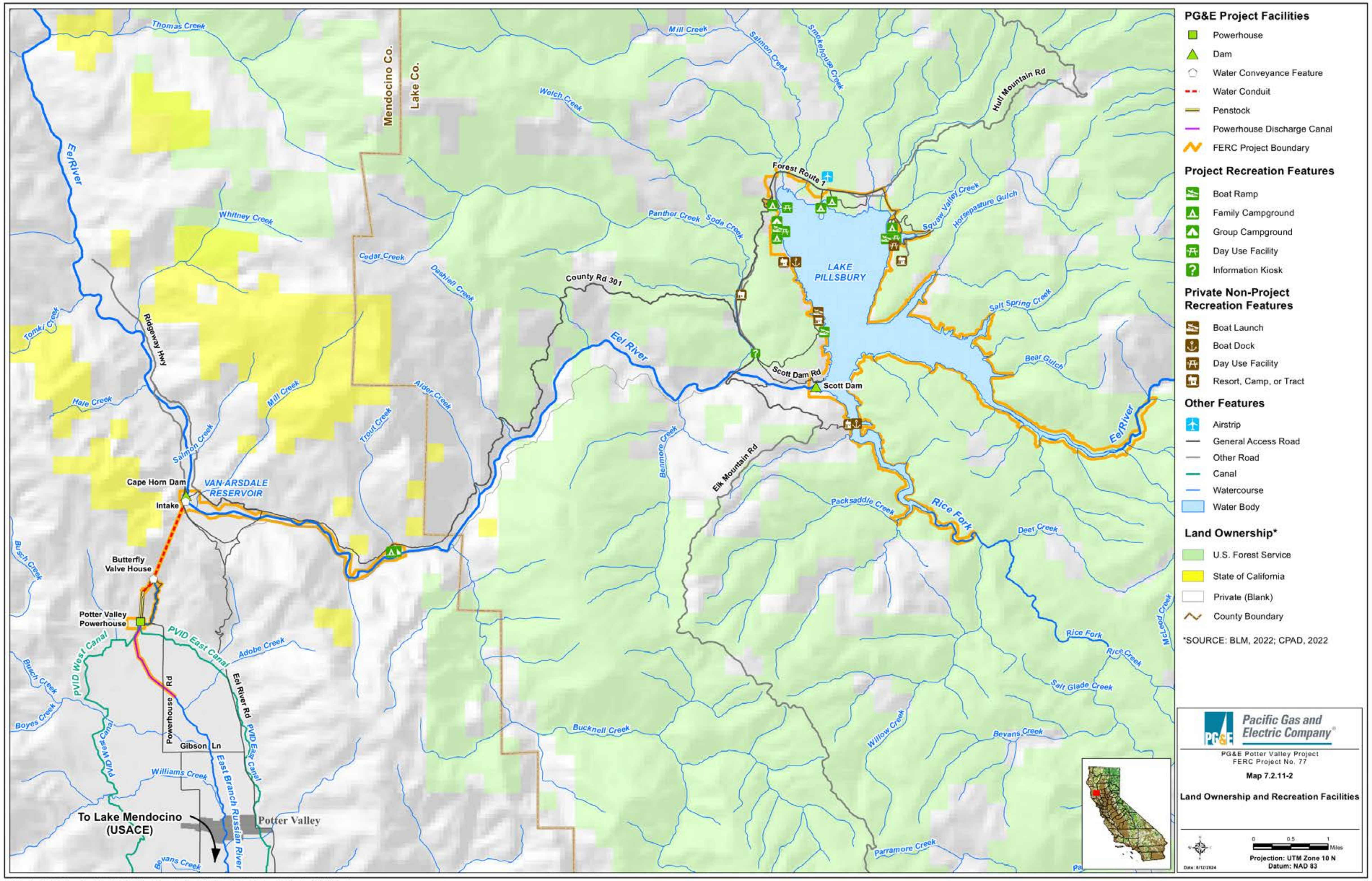
The Scott Dam Area includes Scott Dam, Lake Pillsbury, and the surrounding recreation facilities. Lake Pillsbury, the main storage reservoir for the Project, is formed behind Scott Dam, located on the Eel River in Lake County. Recreation opportunities in the Project vicinity are concentrated around Lake Pillsbury, which inundates land primarily owned by PG&E but is surrounded by public land managed by the MNF, shown on in Map 3.3.9-2.

This Page Intentionally Left Blank



Map 3.3.9-1. Environmental setting for recreation resources.

This Page Intentionally Left Blank



Map 3.3.9-2. Land ownership and recreational facilities.

This Page Intentionally Left Blank

Lake Pillsbury

Lake Pillsbury is formed behind Scott Dam and under normal operating conditions has a surface area of approximately 2,225 acres and a shoreline that is 29 miles (mi.) long (PG&E 2015).

The Mendocino National Forest (MNF) manages public lands under its jurisdiction in the Scott Dam Area (shown in Map 3.3.9-2), in accordance with the MNF Land and Resource Management Plan (LRMP). The MNF LRMP was adopted in 1995 and amended in 2007 when the Snow Mountain Wilderness Area (located within the MNF) was expanded in 2006 under the Northern California Coastal Wild Heritage Wilderness Act of 2006. The MNF LRMP includes goals, objectives, direction, and prescriptions to guide land management activities within the MNF with respect to existing and future desired conditions.

The MNF is divided into 43 management areas (MAs), defined by various factors, including administrative boundaries, watershed boundaries, and special areas. In addition to containing a general forest-wide direction, the LRMP contains specific management prescriptions for each MA. The Scott Dam Area lies within MA #11 – Lake Pillsbury. Direction for MA #11 that specifically relates to recreation at Lake Pillsbury is as follows:

- Emphasize providing quality water-oriented recreation opportunities in a manner consistent with the protection of bald eagles. Expand opportunities in response to anticipated demand. Coordinate all expansion with PG&E and FERC.
- Reduce conflicts between off-highway vehicle (OHV) users and other recreationists through trail designation, administrative controls, and revision of the forest OHV plan.
- Concentrate efforts to inform users about resource protection, fire prevention, and campground regulations. Place priority on law enforcement efforts in this area.
- Analyze opportunities for the development of watchable wildlife areas and wildlife habitat interpretation for the public.
- Maintain the permit for a private resort on the lake for boat rentals, fuel, and so on. Continue to permit the summer home tract.

Additional information regarding this MA and the two contiguous MAs (MA #10 – Ericson Ridge and MA #12 – Skeleton Glade) is available in the 1995 LRMP and 2007-01 LRMP Amendment.

According to the MNF visitor use report (USFS-MNF 2016), in 2013 the MNF received an estimated 254,000 visits. Based on surveys conducted in 2013, nearly 60 percent of MNF visits were by people who live within 25 mi. of the forest (USFS-MNF 2016), indicating the MNF serves a largely local clientele. Because the forest serves primarily local visitors, site visits tend to be short. Based on the 2013 survey results, the median visit duration to the MNF is about 90 minutes (USFS-MNF 2016), indicating the MNF is used mainly for day use.

Recreational Opportunities and Facilities

The Scott Dam Area provides a variety of recreational opportunities. Brief descriptions of the recreation facilities in the Scott Dam Area are provided in the following subsections.

Lake Pillsbury

Lake Pillsbury is the largest waterbody in the MNF and provides a variety of reservoir-based recreation opportunities such as boating, wind surfing, fishing, and swimming. There are a variety of developed recreation facilities in the immediate vicinity of Lake Pillsbury, including family campgrounds, group campgrounds, and day-use facilities that are open to the public, as well as private recreation resorts, camps, and residence tracts that provide overnight and day-use opportunities. Recreation facilities in the immediate vicinity of Lake Pillsbury are shown in Map 3.3.9-3.

Lake Pillsbury is a popular fishing destination and provides the greatest number of fishing days in the MNF (USFS-MNF 1995). Non-native game species in the reservoir include largemouth bass and bluegill; native game species include rainbow trout. California Department of Fish and Wildlife (CDFW) stocks the lake with rainbow trout to supplement natural reproduction (USFS-MNF 1995). Based on records available through the CDFW Statewide Hatchery Database, CDFW stocked a total of 92,235 rainbow trout in Lake Pillsbury between 2002 and 2016.

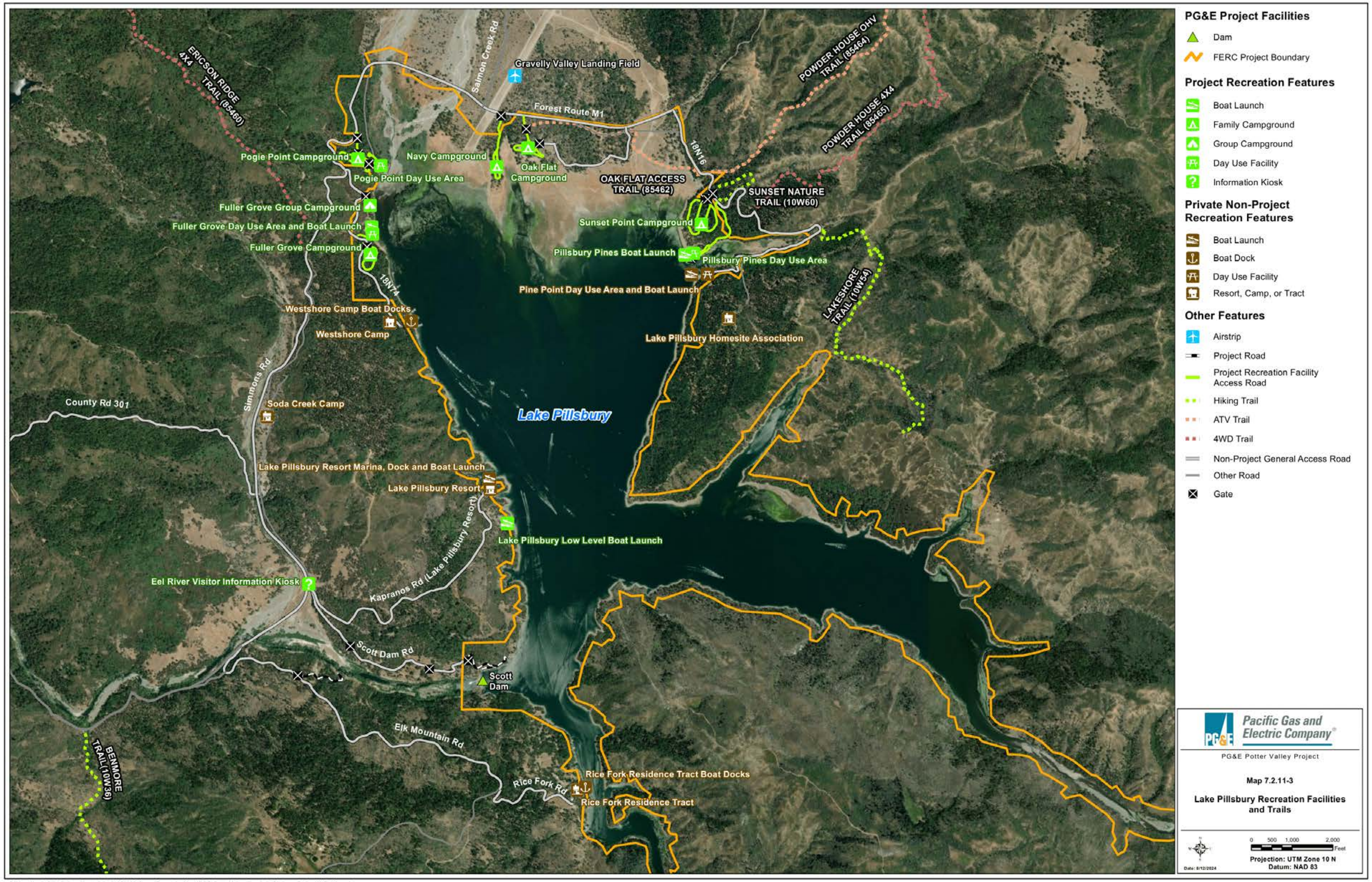
Campgrounds

The following five family campgrounds are located around the north end of Lake Pillsbury, within the Scott Dam Area:

- Fuller Grove Campground (23 sites);
- Navy Campground (20 sites);
- Oak Flat Campground (18 sites);
- Pogie Point Campground (44 sites); and
- Sunset Point Campground (53 sites).

These campgrounds are located primarily on National Forest System Lands (NFSL) and are currently operated and maintained by a recreation management company under a concessionaire contract with PG&E.

Approximate opening and closure dates of recreation facilities are shown in Table 3.3.9-1. All family campgrounds identified above are typically open from mid-April through mid-September, with exceptions made for weather and maintenance activities. Oak Flat Campground is open year-round; potable water is provided during peak recreation season only. The campgrounds are operated on a first-come, first-serve basis with no reservations available.



Map 3.3.9-3. Lake Pillsbury recreation facilities and trails.

This Page Intentionally Left Blank

Table 3.3.9-1. Project recreation facilities.

Facility Name	Location	County	Land Ownership	In FERC Boundary	FERC Boundary Notes	Number of Sites	Capacity (PAOT)[1]	Reservations	Approximate Season[2]	Operation and Maintenance Responsibility
Family Campgrounds										
Fuller Grove Campground	Lake Pillsbury	Lake	USFS	Yes	Portion of access road outside of FERC boundary.	23	138	Not reservable. Operated on a first-come, first-serve basis.	April 15–September 14	Operated and maintained by a recreation management company under a concessionaire contract with PG&E.
Navy Camp Campground	Lake Pillsbury	Lake	USFS	Yes	Portion of access road outside of FERC boundary.	20	120	Not reservable. Operated on a first-come, first-serve basis.	April 15–September 12	
Oak Flat Campground	Lake Pillsbury	Lake	USFS	Yes		18	108	Not reservable. Operated on a first-come, first-serve basis.	Year-Round	
Pogie Point Campground	Lake Pillsbury	Lake	USFS	Yes		44	264	Not reservable. Operated on a first-come, first-serve basis.	April 1–September 12	
Sunset Point Campground	Lake Pillsbury	Lake	USFS	Yes	Portion of access road outside of FERC boundary.	53	318	Not reservable. Operated on a first-come, first-serve basis.	April 15–September 12	
Trout Creek Campground	Van Arsdale Reservoir	Mendocino	PG&E	Yes		15	90	Reservable through www.pge.com/recreation	April 15–September 12	
Group Campgrounds										
Fuller Grove Group Campground	Lake Pillsbury	Lake	PG&E	Yes	Portion of access road outside of FERC boundary.	1	50	Reservable through www.pge.com/recreation	April 15–September 12 (or as reserved)	Operated and maintained by a recreation management company under a concessionaire contract with PG&E.
Trout Creek Group Campground (Consisting of 3 walk-in sites located adjacent to Trout Creek Campground)	Van Arsdale Reservoir	Mendocino	PG&E	Yes		1	18	Reservable through www.pge.com/recreation	April 15–September 12	
Day Use Facilities										
Eel River Visitor Information Kiosk	Junction of Elk Mountain Road, Scott Dam Road, and Forest Service Road M6	Lake	USFS	No		NA	NA	NA	Year-Round	Operated and maintained by a recreation management company under a concessionaire contract with PG&E.
Fuller Grove Day Use Area and Boat Launch	Lake Pillsbury	Lake	PG&E	Yes		NA	NA	NA	Open year-round. Launch availability depends on water level.	
Pillsbury Pines Day Use Area and Boat Launch	Lake Pillsbury	Lake	PG&E	Yes		NA	NA	NA	Open year-round. Launch availability depends on water level.	
Pogie Point Day Use Area	Lake Pillsbury	Lake	USFS	Yes		NA	NA	NA	April 1–September 12	
Lake Pillsbury Low Level Boat Launch	Lake Pillsbury	Lake	PG&E	Yes	Portion of access road outside of FERC boundary.	NA	NA	NA	April 1–September 12	To be maintained by Lake Pillsbury Resort under agreement with PG&E.

1 PAOT = Persons at one time. Capacity assumes 6 PAOT per site. Total capacity excludes host sites.
2 Opening and closing dates may vary depending upon weather, maintenance activities, and other factors. The timing identified in this table is based on 2016 reservation system information.

Notes: PG&E = Pacific Gas and Electric Company
USFS = U.S. Forest Service

This Page Intentionally Left Blank

Table 3.3.9-2. Non-Project recreation facilities in the vicinity of the Project.

Facility Name	Location	County	Land Ownership	In FERC Boundary	Operation and Maintenance Responsibility	Notes
Private Recreation Facilities at or in the Vicinity of Lake Pillsbury						
Lake Pillsbury Resort	Lake Pillsbury	Lake	USFS	Yes (portion)	Lake Pillsbury Resort	Private enterprise operated under agreement with USFS. Includes cabins, 38 campsites, a boat launch, and a "marina" consisting of boat slips, a gas dock, a marine store, and a dock. Bathroom, parking facility, boat launch, and campground are on PG&E land.
Lake Pillsbury Homesite Association	Lake Pillsbury	Lake	USFS	No	Lake Pillsbury Homesite Association	Located on a knoll on USFS land. Residents have long-term leases with the USFS. Boat docks are operated under agreements with PG&E.
Pine Point Day Use Area and Boat Launch (formerly known as Squaw Creek)	Lake Pillsbury	Lake	USFS	Yes	USFS	A small portion of this facility is located on PG&E land. This facility is primarily used by residents of the Lake Pillsbury Homesite Association.
Rice Fork Residence Tract	Lake Pillsbury	Lake	Private	No	Private residents	Privately owned summer vacation homes/cabins located on south arm of Lake Pillsbury. Boat docks are operated under agreements with PG&E.
Soda Creek Camp	Simmons Road	Lake	USFS	No	Private camp operated under USFS permit.	
Westshore Camp	Lake Pillsbury	Lake	PG&E	No	Westshore Campers Association	Private, gated campground that is owned and operated by Westshore Campers Association. Used seasonally. No permanent residents. Operated by Westshore Campers Association under long-term lease agreement with PG&E. Boat docks are operated under agreement with PG&E.
Private Boat Launches and Docks (Operated under Agreements with PG&E)						
Lake Pillsbury Resort Boat Launch and parking facility for public use	Lake Pillsbury	Lake	PG&E	Yes	Lake Pillsbury Resort	Lake Pillsbury Resort may charge a fee for the public to use the boat launch and parking facilities.
Lake Pillsbury Homesite Association Boat Docks and Boat Launch	Lake Pillsbury	Lake	PG&E	Yes	Lake Pillsbury Homesite Association	Public access and use of the Boat Launch Facility is allowed at no cost after closure of the public boat ramp facilities on Lake Pillsbury due to low water levels as long as it is usable without driving on the reservoir bed.
Rice Fork Residence Tract Boat Docks	Lake Pillsbury	Lake	PG&E	Yes	Rice Fork Residence Tract Owners	
Westshore Camp Boat Docks	Lake Pillsbury	Lake	PG&E	Yes	Westshore Campers Association	

Notes: PG&E = Pacific Gas and Electric Company
USFS = U.S. Forest Service

This Page Intentionally Left Blank

In addition to the family campgrounds listed above, the Fuller Grove Group Campground is located at the northwest end of Lake Pillsbury and can accommodate a total of 50 persons at one time (PAOT). The campground is located on PG&E land and is currently operated and maintained by a recreation management company. As shown in Table 3.3.9-2, the campground is typically open from mid-April through mid-September. Reservations can be made through PG&E's recreation website (www.pge.com/recreation).

Fuller Grove Day Use Area and Boat Launch

This facility consists of a paved boat ramp and parking area located on the northwest end of Lake Pillsbury, between Fuller Grove Campground and Fuller Grove Group Campground. This facility is within the FERC Project boundary, on land owned by PG&E, and operated and maintained by a recreation management company. The Fuller Grove Day Use Area is open year-round; however, it closes when water levels are below that which the boat launch can be used safely.

Pillsbury Pines Day Use Area and Boat Launch

Located on the northeast end of Lake Pillsbury, near Sunset Point Campground, this facility consists of a paved boat launch, parking, and picnic areas. This facility is within the FERC Project boundary, on land owned by PG&E, and operated and maintained by a recreation management company. The Pillsbury Pines Day Use Area is open year-round; however, it closes when water levels drop to a point when the boat launch can no longer be used safely.

Pogie Point Day Use Area

Located on the northwest end of Lake Pillsbury, within the boundary of Pogie Point Campground, this facility consists of a designated parking area, a kiosk, and a day-use area with picnic tables. This facility is located within the FERC Project boundary, primarily on NFSL, and is operated and maintained by a recreation management company. This facility is typically open from April 1 through mid-September.

Lake Pillsbury Low-Level Boat Launch

PG&E constructed this boat ramp in 2017 as required by Article 56 of the Project license. The new low-level boat launch is located within the FERC Project boundary on PG&E land just south of Lake Pillsbury Resort. A portion of the access road is outside of the FERC Project boundary.

This facility is open from April 1 through mid-September. The boat ramp is operated and maintained by Lake Pillsbury Resort under an agreement with PG&E.

Existing Non-Project Recreation Facilities

As shown on Map 3.3.9-3, a variety of non-Project recreation facilities, including resorts, private camps, and private residence tracts, are located around Lake Pillsbury. Table 3.3.9-2 identifies non-Project recreation facilities in the vicinity of Lake Pillsbury and indicates whether the facility is located within the FERC boundary.

With the exception of Westshore Camp and a portion of the campground at Lake Pillsbury Resort, all of the non-Project recreation facilities in the vicinity of Lake Pillsbury are located on NFSL and are operated under long-term lease agreements with USFS. The Westshore Camp and a portion of the Lake Pillsbury Resort campground are located on PG&E land and are operated under agreement with PG&E.

Private boat docks and/or launches along the shoreline of Lake Pillsbury, within the FERC Project boundary, are located on land owned by PG&E. Non-Project uses and occupancy of Project shorelines are addressed through long-term lease or license agreements between PG&E and private parties. Table 3.3.8-1 lists existing leases and licenses PG&E has issued (as of May 20, 2024) for non-Project use and occupancy of Project lands within the FERC Project boundary, grouped by geographic area.

Hiking Trails

There are no hiking trails within the FERC Project boundary. However, as shown on Map 3.3.9-1, there are two hiking trails east of Lake Pillsbury. These trails are the Lakeshore Trail (FS 10W54) and the Sunset Nature Trail (FS 10W60).

Off-Highway Vehicle Trails

The Lake Pillsbury area is a base for OHV use and provides opportunities for a variety of vehicle types, including motorcycles, all-terrain vehicles (ATVs), dune buggies, side-by-sides, and 4×4s. Travel on National Forest System roads in the Lake Pillsbury area is managed and controlled by the MNF pursuant to regulations contained in 36 Code of Federal Regulations (CFR) 212.51. According to the MNF, conflicts between OHV use and other recreation users are common throughout the year and frequently require law enforcement efforts (USFS-MNF 1995). As mentioned above, the MNF LRMP contains management direction aimed at reducing conflicts between OHV users and other recreationists (e.g., trail designations and administrative controls). Road and trail use designations in the Project vicinity are shown on MNF Motor Vehicle Use Map – South Central Map and Insets (USFS-MNF 2017).

As indicated on Map 3.3.9-3 the MNF manages a variety of designated roads and trails in the vicinity of the Project, primarily along the north end of Lake Pillsbury. In general, these include roads open to highway legal vehicles, roads open to all vehicles, and trails open to vehicles 50 inches wide or narrower. Most roads in the Project vicinity include seasonal and/or special vehicle designations to protect natural resources. All roads and trails open to motorized travel in the MNF are shown on motor vehicle use maps. Roads and trails not shown on the motor vehicle use maps are not open to public motor vehicle travel.

3.3.9.4 Cape Horn Dam Area

The Cape Horn Dam Area includes Cape Horn Dam, Van Arsdale Reservoir, the water diversion system between the Eel River and East Branch Russian River, and the Potter Valley Powerhouse. Van Arsdale Reservoir is located approximately 12 mi. downstream of Lake Pillsbury, outside the MNF.

Van Arsdale Reservoir

Van Arsdale Reservoir is formed behind Cape Horn Dam and under normal operating conditions has a surface area of approximately 65 acres and a 7-mi.-long shoreline (PG&E 2015). It is located on the Eel River, in Mendocino County, outside of the MNF.

The land underlying and surrounding the reservoir is primarily owned by PG&E and other private parties. According to studies conducted by PG&E and reported in the Revised Exhibit R for the Project (PG&E 1986), "private ownership of land adjacent to Van Arsdale Reservoir, poor soil conditions and limited potential to reconcile public safety requirement with Project operations, collectively reflect a high level of constraint for recreational development." As a result, recreation development in the Van Arsdale Reservoir area is limited to one family campground and one group campground located at the upper end of the reservoir.

Recreational Opportunities and Facilities

Recreational opportunities within the Cape Horn Dam Area are limited. The available facilities are summarized below.

Campgrounds

PG&E's Trout Creek Campground, which accommodates 15 sites, is located at the upper end of Van Arsdale Reservoir. The Trout Creek Group Campground is a walk-in, group campground that consists of three sites formerly part of the Trout Creek Campground. Trout Creek Group Campground accommodates a total of 18 PAOT. The campgrounds are located on PG&E land and are currently operated and maintained by a recreation management company under a concessionaire contract with PG&E. The grounds are typically open from mid-April through mid-September, with exceptions made for weather and maintenance activities. Trout Creek Campground has both first-come first-serve and reservable sites; reservable sites can be reserved through PG&E's recreation website (www.pge.com/recreation).

3.3.9.5 Eel River Watershed

The 196-mi.-long Eel River begins in the Coast Range, north and east of the Project, and generally flows northward through the Coast Range to the Pacific Ocean. The mouth of the Eel River is located in Humboldt County, about 10 mi. south of the town of Fortuna, California. Project facilities are located near the headwaters of the Eel River. Four major tributaries—the North Fork Eel River, South Fork Eel River, Middle Fork Eel River, and Van Duzen River—enter the Eel River downstream of the Project.

Eel River between Lake Pillsbury and Van Arsdale Reservoir

Between Lake Pillsbury and Van Arsdale Reservoir, the Eel River primarily flows across privately-owned land with some parcels under the jurisdiction of the MNF (see Map 3.3.9-2). Recreational opportunities, use, and development along the Eel River between Lake Pillsbury and Van Arsdale Reservoir are limited, primarily due to the steep terrain and access issues. According to studies conducted by PG&E and reported in the Revised Exhibit R for the Project (PG&E 1986), "permanent recreational facilities to accommodate use along the river between Lake Pillsbury and Van Arsdale are not feasible, excepting at Benmore Creek. Many habitation sites of archaeological significance and a riparian vegetative community, felt to be critical in terms of wildlife habitat, are dominant limiting factors. Steep and unstable slopes along the river canyon and minimal vehicular access further limit the potential for permanent facilities." Based on consultation with USFS, the Benmore Creek site was eliminated from future development in favor of a more suitable location. The Navy Camp Campground at Lake Pillsbury was developed by PG&E in lieu of a facility at Benmore Creek (PG&E 1997).

Pursuant to CDFW regulations, fishing is not allowed on the Eel River between Cape Horn Dam and Scott Dam (CDFW 2024).

Eel River Downstream of Van Arsdale Reservoir

The Eel River from 100 yards downstream of Cape Horn Dam to its mouth and its four main tributaries (Middle Fork Eel, North Fork Eel, South Fork Eel, and Van Duzen River) are designated as Wild and Scenic rivers. Segments of the river bisecting public land are managed by Bureau of Land Management, California Resources Agency, and USFS, depending upon jurisdiction. The Round Valley Indian Reservation manages a segment that passes across its land.

Land downstream of Van Arsdale Reservoir bisected by the Eel River is primarily privately owned. For this reason, public access along the Eel River downstream of Van Arsdale Reservoir is limited.

Recreational Opportunities and Facilities

The available recreational opportunities and/or facilities are summarized below.

Whitewater Boating

The Eel River provides a variety of whitewater boating opportunities, especially during the spring and winter rainy season. The main whitewater boating runs on the Eel River as identified by California Creeks are summarized in Table 3.3.9-3 (Tuthill 2024). Runs range from Class I to Class III+, enabling trip durations of one to several days. Main tributaries to the Eel River are boatable, including some of the smaller creeks, depending upon skill level. Runs on the Middle Fork and South Fork Eel rivers are often combined with runs on the main Eel River, allowing for longer runs or reduced shuttle time.

A whitewater boating focus group meeting was conducted in 2018[1] to discuss existing whitewater boating in the Project area. The main whitewater boating runs on the Eel River as identified during the focus group meeting are depicted in Map 3.3.9-4.

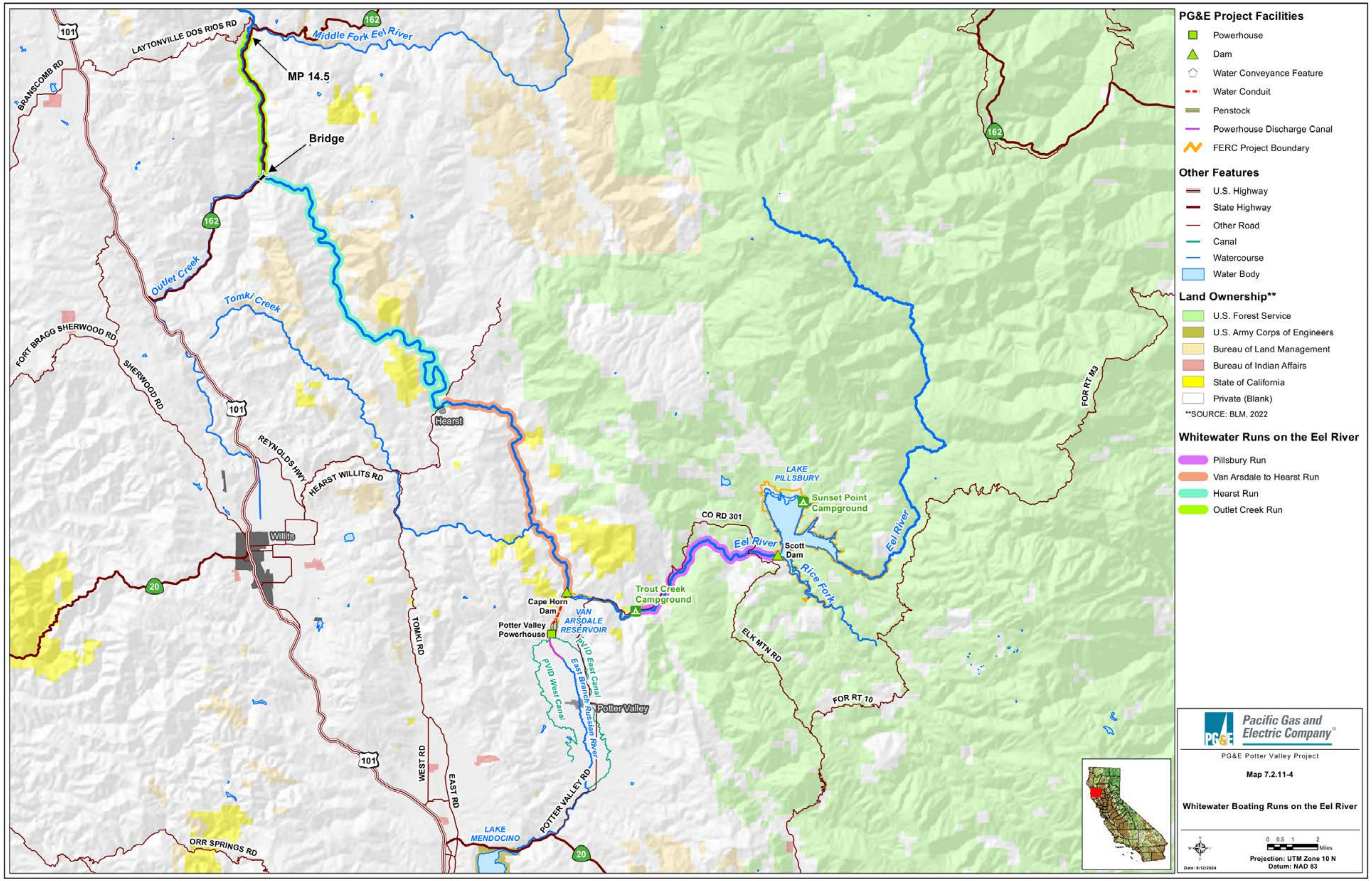
[1] The Whitewater Boating Focus Group Meeting was held on October 29, 2018, at the Ukiah Valley Conference Center, in Ukiah, California.

Table 3.3.9-3. Whitewater boating runs on the Eel River.

Run Segment/ Run Name	Put In	Take Out(s)	Gradient	Approximate Length (mi.)	Duration (days)	Overall Rating[2]	Boatable Flow Range (cubic feet per second [cfs])	Notes[3]
Eel River[1]								
Eel River below Pillsbury Reservoir (Pillsbury Run)	Below Scott Dam, on right bank under Elk Mountain Road Bridge	Bucknell Creek, left bank; Trout Creek Campground; Eel River Road Bridge, right bank	23 ft/mi.	5.7 mi. to Bucknell Creek 6.2 mi. to Trout Creek Campground 8.8 mi. to Eel River Road Bridge	1	III+ IV above 1,000 IV+ above 2,000	Raft: (500) 900–3,000 Hardshell Kayak: 300–6,000 Inflatable Kayak: minimum 200	• Excellent run in October and November when flows are released from Pillsbury Reservoir. • Can extend run by taking out at Trout Creek Campground or Eel River Road Bridge, just above Van Arsdale Reservoir. • Known as “Pillsbury Run” (see Map 3.3.9-4). • Unpredictable and variable flow rates do not allow for commercial use. • Boaters refer to California Data Exchange Center website for inflow into Van Arsdale and outflow to Russian River diversion project to estimate if flows are suitable for boating. • Access issues at Benmore and Bucknell (i.e., boulders blocking access, security concerns).
Eel River above Hearst (Van Arsdale to Hearst Run)	Below Cape Horn Dam, or River Mile 155	Hearst Bridge over Eel River	Unknown	11.6 mi.	1	II-III	Raft: 1,500-6,000 Hardshell Kayak: 1,000-6,000 Inflatable Kayak: 500-5,000	• Known as “Van Arsdale to Hearst Run” (see Map 3.3.9-4). • Unpredictable and variable flow rates do not allow for commercial use. • Boaters look at Dreamflows websites for hourly outflow from Van Arsdale Reservoir to estimate if flows are suitable for boating. • Put-in location is very brushy.
Eel River below Hearst (Hearst Run)	Bridge near town of Hearst	Bridge at Outlet Creek confluence	16 ft/mi.	18.5 mi.	1	II with Class III section	Raft and Hardshell Kayak: 500–8,000	• At flows below 2,000 cubic feet per second, run can be completed in 1 long day. At flows above 3,000 cubic feet per second, run can be completed in 4 hours or less. • Known as “Hearst Run” (see Map 3.3.9-4). • Boaters reference the California Data Exchange Center and Dreamflows websites to view outflow from Van Arsdale Reservoir to estimate boating availability. • Put-in and take-out locations are on private property.
Eel River above Middle Fork Confluence (Outlet Creek Run)	Highway 162 bridge over the Eel River	Highway 162 milepost 14.5, just above Middle Fork Eel River	20 ft/mi.	6 mi.	1	III Harder at higher flows	Raft: 500–20,000 Hardshell Kayak: 300–20,000	• One of the best Class III runs on the Eel River, but it does not see much use, except from locals, due to unpredictability of flow. • Can be run multiple times in one day. • Known as “Outlet Creek Run” (see Map 3.3.9-4). • Boaters reference the California Data Exchange Center and Dreamflows websites to view outflow from Van Arsdale Reservoir and use their experience to estimate boating availability. • Take-out location is on private property.
Eel River below Middle Fork Confluence[4]	Dos Rios, near confluence of Middle Fork Eel River	Bridge crossing near town of Alderpoint (difficult access) or Fort Seward (easier access)	13 ft/mi.	47 mi. to Alderpoint 53 mi. to Fort Seward	3 to 5	II with 6 Class III rapids	Raft: 1,500–10,000 Hardshell Kayak: 1,000–10,000 Inflatable Kayak: minimum 800	• Boatable in winter to early summer on rain or snowmelt.

Notes:
[1] This table was developed primarily using information available at www.cacreeks.com (Tuthill 2024).
[2] Overall rating based on international scale of difficulty.
[3] Notes from the 2018 whitewater boating focus group meeting are included in blue text.
[4] The Eel River below Middle Fork Confluence run segment is not shown in Map 3.3.9-4.

This Page Intentionally Left Blank



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\RecreationMaps\PGE_PotterValley_Rec_WWRuns_EelRiver_17i11i_10.mxd

Map 3.3.9-4. Whitewater boating runs on the Eel River.

This Page Intentionally Left Blank

Eel River Visitor Information Kiosk

Located at the junction of Elk Mountain Road and Scott Dam Road, the Eel River Visitor Information Kiosk includes an information kiosk, parking area, and signage. Constructed in the early 1990s under an Individual Facility Agreement between PG&E and the USFS, and executed on June 19, 1990, the kiosk is not within the FERC Project boundary, but is identified in PG&E's Revised Exhibit R (Amendment No. 1) for the Potter Valley Project, dated July 1986 and is considered a Project facility. This facility is open year-round.

3.3.9.6 Russian River Watershed

The Russian River Watershed extends within portions of Lake County, Mendocino County, and Sonoma County. The Russian River Watershed is less than half the size of the Eel River Watershed and drains an area of approximately 1,484 square miles ($mi.^2$). The discussion herein focuses on the East Branch Russian River (EBBR), between the Potter Valley Powerhouse and Lake Mendocino.

The upper portion of the EBBR bisects the Potter Valley, which is dominated by privately-owned agricultural land. South of the Potter Valley, the EBBR continues southwestward through mostly undeveloped, more heavily vegetated hills, then along Highway 20 until it discharges into Lake Mendocino.

Recreational Opportunities and Facilities

The information about recreational opportunities along the EBBR discussed below was developed during a site visit conducted with interested stakeholders and during the whitewater focus group session, both conducted as part of the relicensing process in 2018. The site visit was conducted on October 24, 2018, to observe and discuss recreation-related conditions along the EBBR and to determine if minimum instream flows are conducive to angling, swimming, and wading. The meeting was attended by representatives from CDFW, PG&E, Sonoma Water, Potter Valley Irrigation District, and members of the general public. A total of 10 sites were visited between the Potter Valley Powerhouse and Lake Mendocino.

Day Use Opportunities

Potter Valley is dominated by private agricultural land. Therefore, there are no developed recreation facilities along the EBBR between Potter Valley Powerhouse and Highway 20. The nearest developed recreation facilities are Eastside Trailhead Parking, Kyen Campground, and Bushay Campground, all located on the north end of Lake Mendocino. Lake Mendocino, and the associated recreation facilities, are owned and operated by the US Army Corps of Engineers.

In general, the group agreed that the recreation opportunities along the EBBR where it bisects Potter Valley are extremely limited owing to the presence of private property, steeply incised banks, and dense vegetation, all of which impede access. A limited amount of day use likely occurs at bridge crossings. Stream-based recreation is more prevalent along the lower EBBR, between the southern end of the Potter Valley and Lake Mendocino, where access is available from Potter Valley Road. Conditions along the EBBR downstream of the Potter Valley are more conducive to recreation, specifically angling, swimming and wading. The CDFW regularly stocks this section of the EBBR with trout, which likely draws anglers.

Whitewater Boating

According to information provided during the whitewater boating focus group, whitewater boating occurs along the East Branch Russian River Run, from Three Rock Falls to Lake Mendocino. The run length is approximately 2.6 mi. with an estimated Class II to Class III difficulty rating. This run is supported by water diverted from the Eel River to the Russian River.

3.3.9.7 Current Recreation Use of Project Lands

Although no longer required by FERC, PG&E previously collected recreation use data and provided FERC with recreation use estimates for the Project every 6 years in conjunction with the Form 80 reporting cycle.[2] FERC required estimates for each "development," defined as "the portion of a project which includes: (a) a reservoir; or (b) a generating station and its specifically-related waterways." Accordingly, PG&E filed two Form 80s, one for Van Arsdale Reservoir and the other for Lake Pillsbury. PG&E's recreational use estimates for Van Arsdale Reservoir and Lake Pillsbury for Form 80 reporting years 2002, 2008, and 2014 are listed in Table 3.3.9-4.

Table 3.3.9-4. Estimated recreation use associated with the Project.

Report Year Ending	Summer Period	Number of Recreation Days[1]			
		Annual Total		Peak Weekend Average	
		Daytime	Nighttime	Daytime	Nighttime
Van Arsdale Reservoir Development[2]					
2002	4/26–9/5	500	2,000	20	215
2008	5/1–9/5	2,700	2,300	380	200
2014	5/1–11/15	1,705[3]	2,836	246	152
Lake Pillsbury Development[2]					
2002	5/1–9/30	67,500	20,300	2,800	1,000
2008	5/1–9/5	35,000	21,500	3,300	750
2014	5/1–9/5	22,106	12,444	441	2,628

1 A "recreation day" is defined by FERC as "each visit by a person to a development for recreational purposes during any portion of a 24-hour period."
2 A "development" is defined by FERC as "the portion of a project which includes: (a) a reservoir; or (b) a generating station and its specifically-related waterways."
3 Form 80 reported 17,005 recreation days, but based on the data from previous years, this number appears to have a typo and is presumed to be 1,705.

Nights camped per campground based on information collected by the recreation management company (PG&E's concessionaire) from 2018 through 2023 are listed in Table 3.3.9-5. As

[2] The FERC eliminated the Form 80 reporting requirement by final rule effective March 28, 2019.

demonstrated in the tables, recreation use at Lake Pillsbury is substantially higher than at Van Arsdale Reservoir, a reflection of the larger reservoir size, better access, and higher development scale.

Table 3.3.9-5. Nights camped per campground 2018–2023.

Campground	2018	2019	2020	2021	2022	2023
Trout Creek	162	377	150	777	644	701
Pogie Point	118	203	169	54	39	47
Fuller Grove	477	701	500	258	577	526
Fuller Grove Group	17	58	0	0	36	60
Oak Flat	755	1,206	561	994	1,028	1,067
Navy Camp	239	387	149	83	126	185
Sunset Point	986	1,300	853	731	1,132	1,579

3.3.9.8 Current and Future Recreation Needs

FERC regulations require a discussion of current and future recreation needs identified in state comprehensive plans and regional conservation and recreation plans. FERC's 2024 *List of Comprehensive Plans* includes the following five plans that specifically pertain to recreation:

- CDPR's *Public Opinions and Attitudes on Outdoor Recreation in California* (CDPR 1998);
- CDPR's *Recreation Outlook in Planning District 2* (CDPR 1980a);
- CDPR's *Recreation Outlook in Planning District 3* (CDPR 1980b);
- CDPR's *California Outdoor Recreation Plan* (CDPR 1994); and
- USFS-MNF's *Mendocino National Forest Land and Resource Management Plan* (USFS-MNF 1995).

CDPR plans identified on FERC's 2024 *List of Comprehensive Plans* are outdated and have since been updated and/or replaced with other, more recent plans, the most significant being the 2021–2025 SCORP, published in 2021. Therefore, only the SCORP and the LRMP (also on the FERC's list) are discussed below.

California Outdoor Recreation Plan and Related Reports

The SCORP is updated every 5 years and establishes priorities for grant funding to address needs for public outdoor recreation land throughout the state (CDPR 2021). The 2021 SCORP, which supersedes the 2015 SCORP, does not contain specific information regarding recreation use or trends in the Project area. However, the following two reports contain information that may be relevant to the Project:

- CDPR's 2012 SPOA (CDPR 2014); and
- *Outdoor Recreation in California's Regions* 2013 (CDPR 2013).

The Project lies within CDPR's Northern California Planning Area. The CDPR's *Outdoor Recreation in California's Regions* 2013 report (CDPR 2013) includes a variety of information about the Northern California Planning Area based on surveys conducted in 2010 and reported in the 2012 SPOA (CDPR 2014). For example:

- In 2010, the region had the lowest average median annual household income of residents by region statewide;
- In 2010, the region had a lower percentage of residents 49 years of age and under and a higher percentage who were 50 years of age and over;
- In 2060, the Northern California region is projected to have the lowest percentage of people aged 5 to 17 and the highest percentage of residents aged 65 and over; and
- The region faces economic challenges that can be addressed by creating outdoor recreation-related jobs and by stimulating outdoor recreation-related economic/business activity.

These findings may be important when addressing current and future recreation needs in the Project area.

Mendocino National Forest Land and Resource Management Plan

FERC's 2024 *List of Comprehensive Plans* identifies the MNF LRMP. This plan provides management direction that reflects a variety of activities, allows for the use and protection of forest resources, and fulfills legislative requirements while addressing local, regional, and national issues. The LRMP describes the desired future of the MNF and provides forest-wide management direction and prescriptions for individual MAs. The LRMP applies to all NFSL administered by the MNF.

Lake Pillsbury is within the boundaries of the MNF, in MA #11. Land use and management in the vicinity of Lake Pillsbury, including recreation development, must be consistent with the goals, direction, and prescriptions associated with MA #11 and documented in the LRMP. As summarized in Section 3.3.8, the MA description includes the management direction applicable to recreation in the Scott Dam Area, including all of Lake Pillsbury. In accordance with the LRMP, all management activities or development actions at Lake Pillsbury taken to meet current and future recreation needs must be consistent with the LRMP management prescriptions.

3.3.9.9 References

Camava. 2024. "Occupancy Proof" Report, January 1, 2018 to December 31, 2023. Pacific Gas & Electric Reservations, Registrations and Point of Sale System. Available at https://recreation.pge.com/Intranet/home.asp. Accessed May 2024.

CDFW (California Department of Fish and Wildlife). 2024. 2024–2025 California freshwater sport fishing regulations. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=209090&inline. Accessed July 2024.

CDPR (California Department of Parks and Recreation). 2021. California's 2021–2025 statewide comprehensive outdoor recreation plan (SCORP). Available at: https://www.parksforcalifornia.org/scorp/2021. Accessed July 2024.

CDPR (California Department of Parks and Recreation). 2014. Survey on public opinions and attitudes on outdoor recreation in California (SPOA) 2012, complete findings. January.

CDPR (California Department of Parks and Recreation). 2013. Outdoor recreation in California's regions 2013.

CDPR (California Department of Parks and Recreation). 1998. Public opinions and attitudes on outdoor recreation in California. Sacramento, CA. March 1998.

CDPR (California Department of Parks and Recreation). 1994. California outdoor recreation plan. Sacramento, CA. April 1994.

CDPR (California Department of Parks and Recreation). 1980a. Recreation outlook in Planning District 2. Sacramento, CA. April 1980.

CDPR (California Department of Parks and Recreation). 1980b. Recreation outlook in Planning District 3. Sacramento, CA. June 1980.

FERC (Federal Energy Regulatory Commission). 2024. List of comprehensive plans. April. Available at: https://cms.ferc.gov/media/comprehensive-plans. Accessed July 2024.

PG&E (Pacific Gas and Electric Company). 2015. Form 80 recreation use reports for the Van Arsdale Reservoir and Lake Pillsbury Developments.

PG&E (Pacific Gas and Electric Company). 2009. Form 80 recreation use reports for the Van Arsdale Reservoir and Lake Pillsbury Developments.

PG&E (Pacific Gas and Electric Company). 2003. Form 80 recreation use reports for the Van Arsdale Reservoir and Lake Pillsbury developments.

PG&E (Pacific Gas and Electric Company). 1997. Potter Valley Project, FERC No. 77, supplemental filing to Docket No. 77-103. February 3.

PG&E (Pacific Gas and Electric Company). 1986. Potter Valley Project (FERC 77) revised Exhibit R. Amendment No. 1. July.

Tuthill, Bill. 2024. California creeks whitewater boating web guide. Available at: www.cacreeks.com. Accessed July 2024.

USFS (U.S. Forest Service). 2023. National visitor use monitoring survey results, national summary report, data collected FY 2018 through FY 2022. September. Available at: https://www.fs.usda.gov/sites/default/files/2022-National-Visitor-Use-Monitoring-Summary-Report.pdf. Accessed July 2024.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 2017. Motor vehicle use map, south central map and insets. Available at: www.fs.usda.gov/detailfull/mendocino/maps-pubs. Accessed July 2024.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 2016. Visitor Use Report. National visitor use monitoring data collected FY 2013. September.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 1995. Mendocino National Forest Land and Resource Management Plan (LRMP). February. Available at: https://www.fs.usda.gov/detailfull/mendocino/landmanagement?cid=FSBDEV3_004518. Accessed July 2024.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
FERC	Federal Energy Regulatory Commission
ft.	feet
LRMP	Land and Resource Management Plan
mi.	mile
MNF	Mendocino National Forest
ORV	Outstandingly Remarkable Value
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
USFS	U.S. Forest Service
VQO	Visual Quality Objective
W&SR	Wild and Scenic Rivers

3.3.10 Aesthetic Resources

3.3.10.1 Introduction

This section describes the aesthetic resources in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). Specifically, this section provides background information on the applicable regulations governing scenic resources, visual resources management plans, and scenic designations with applicability to the Project followed by an overview of the existing visual conditions in each of the four Project regions: (1) Scott Dam Area, (2) Cape Horn Dam Area, (3) Eel River Watershed, and (4) Russian River Watershed. Potential environmental effects related to aesthetics are addressed in Sections 3.4.1.11 and 3.5.1.11.

3.3.10.2 Information Sources

The information presented in this section is primarily based on data from the following sources:

- California Department of Transportation (Caltrans) State Scenic Highway System Map (Caltrans 2024);
- Lake County General Plan (Lake County 2008);
- Mendocino County General Plan (Mendocino County 2020);
- National Wild and Scenic Rivers (W&SR) System's map of California (National W&SR System 2024); and
- U.S. Forest Service (USFS) Mendocino National Forest (MNF) Land and Resource Management Plan (USFS-MNF 1995).

3.3.10.3 Background Information

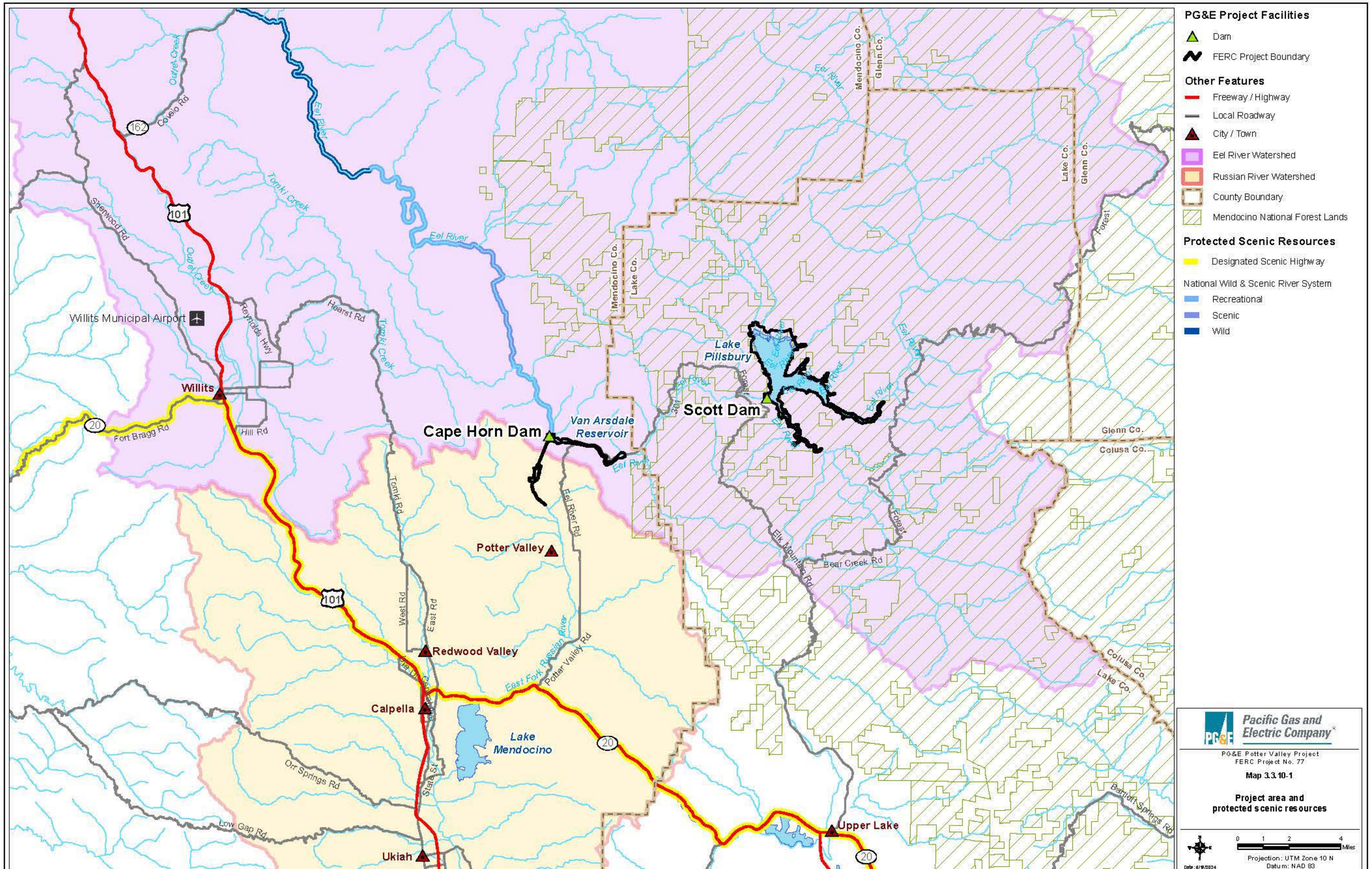
Applicable Regulations

The following provides a discussion of the federal, state, and local regulations that relate to aesthetic resources that may be applicable to one or more Project regions. Planned Project actions are primarily located in Lake and Mendocino counties, with portions of the Project also within the MNF (see Map 3.3.10-1); therefore, the applicable Lake County, Mendocino County, and MNF regulations are presented below.

Federal Regulations

National W&SR System. The National W&SR System was created in 1968 to preserve rivers with outstanding natural, cultural, and recreational values in a free-flowing condition. There are three river classifications: "wild river areas" (generally free of impoundments and generally inaccessible), "scenic river areas" (generally free of impoundments with some accessibility), and "recreational river areas" (may contain some form of impoundment and are readily accessible).

This Page Intentionally Left Blank



Map 3.3.10-1. Project area and protected scenic resources.

This Page Intentionally Left Blank

The Wild and Scenic Rivers Act establishes specific criteria for each "outstandingly remarkable value" (ORV) that qualifies a river segment for protection. For an analysis of aesthetic resources, the relevant ORV is Scenery.

River segments that have been designated with the Scenery ORV exhibit elements of landform, vegetation, water, color, and related actors resulting in an exemplary visual feature (National Park Service 2011). Within California, only 1.1 percent of the state's rivers qualify for protection under the National W&SR System (National W&SR System 2024).

The Eel River from 300 feet (ft.) downstream of the Cape Horn Dam[1] to the mouth at the Pacific Ocean, and several of its primary tributaries, is protected as part of the National W&SR System. Map 3.3.10-1 shows the locations of each designated Eel River segment. Table 3.3.10-1 identifies the specific classifications and ORVs that pertain to each designated Eel River segment.

Mendocino National Forest Land and Resource Management Plan. The USFS has prepared a land and resource management plan (LRMP) for the MNF, which includes management goals, objectives, and related direction for a variety of resources (USFS-MNF 1995). It is noted that the LRMP is only applicable to lands under the jurisdiction of USFS. This discussion focuses on the goals and objectives set forth in the LRMP that relate to aesthetic resources.

One of the goals presented in the LRMP is to maintain scenic quality along key travel corridors, key dispersed recreation areas, developed sites, and other highly scenic areas to provide a visually pleasing setting to complement current and protected recreation uses.

USFS protects aesthetic resources using an analytical model called the Visual Management System to establish visual quality objectives (VQOs) for forest management. The VQOs define theoretically acceptable limits of visual modification for particular areas within USFS lands and are classified according to the degree of inherent scenic attractiveness, visual variety, and viewer sensitivity level. The standards and guidelines for each VQO are described in Table 3.3.10-2.

State Regulations

California State Scenic Highway Program. California's State Scenic Highway Program was created by the State Legislature in 1963 to preserve and protect scenic highway corridors from change that would diminish the aesthetic value of lands adjacent to highways. The State Scenic Highway System includes a list of highways that are either eligible for designation as scenic highways or are currently designated.

A highway may be designated as scenic depending upon how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the traveler's enjoyment of the view. Scenic corridors are lands that comprise scenic and natural features visible from designated highway rights-of-way.

[1] Note that the National W&SR System website refers to Cape Horn Dam as Van Arsdale Dam.

Table 3.3.10-1. Designated National Wild and Scenic River segments on the Eel River and tributaries.

Beginning Point	End Point	W&SR System Classification	ORVs
Mainstem Eel River			
Eel River from 300 ft. below Cape Horn Dam	Eel River to confluence with Tomki Creek	Recreational	Fish
Eel River to confluence with Tomki Creek	Eel River to middle of Section 22, Township 19 North, Range 12 West	Scenic	Fish
Eel River to middle of Section 22, Township 19 North, Range 12 West	Eel River to boundary between Sections 7 and 8, Township 19 North, Range 12 West	Recreational	Fish
Eel River to boundary between Sections 7 and 8, Township 19 North, Range 12 West	Eel River to confluence with Outlet Creek	Wild	Fish
Eel River to confluence with Outlet Creek	Eel River to mouth at Pacific Ocean	Recreational	Fish
Middle Fork Eel River			
Middle Fork at southern boundary of Middle Eel-Yolla Bolly Wilderness	Eel River Ranger Station	Wild	Fish
Middle Fork Eel from the intersection of the river with the southern boundary of the Middle Eel-Yolla Bolly Wilderness Area	Middle Fork Eel to the Eel River Ranger Station	Wild	Fish, Recreation
Middle Fork Eel to the Eel River Ranger Station	Middle Fork Eel to Williams Creek	Recreational	Fish, Recreation
Middle Fork Eel to Williams Creek	Middle Fork Eel to southern boundary of the northern quarter of Section 25, Township 22 North, Range 12 West	Scenic	Fish, Recreation
Middle Fork Eel to southern boundary of the northern quarter of Section 25, Township 22 North, Range 12 West	Middle Fork Eel to boundary between Sections 4 and 5, Township 21 North, Range 13 West	Wild	Fish, Wildlife, Recreation
Middle Fork Eel to boundary between Sections 4 and 5, Township 21 North, Range 13 West	Middle Fork Eel to confluence with main Eel at Dos Rios	Recreational	Fish, Recreation

Beginning Point	End Point	W&SR System Classification	ORVs
North Fork Eel River			
North Fork–Old Gilman Ranch	Forest boundary	Wild	Fish
North Fork Eel from the Old Gilman Ranch	North Fork Eel to the middle of Section 8, Township 24 North, Range 13 West	Wild	Fish
North Fork Eel from the middle of Section 8, Township 24 North, Range 13 West	North Fork Eel to boundary between Sections 12 and 13, Township 24 North, Range 14 West	Recreational	Fish, Recreation
North Fork Eel from the boundary between Sections 12 and 13, Township 24 North, Range 14 West	North Fork Eel to the confluence with the main Eel	Wild	Fish
South Fork Eel River			
South Fork Eel from the mouth of Section Four Creek near Branscomb	South Fork Eel to Horseshoe Bend	Recreational	Fish
South Fork Eel to Horseshoe Bend	South Fork Eel to the middle of Section 29, Township 23 North, Range 16 West	Wild	Fish
South Fork Eel to the middle of Section 29, Township 23 North, Range 16 West	South Fork Eel to confluence with main Eel near Weott	Recreational	Fish
Van Duzen River			
Van Duzen River from Dinsmore Bridge	Van Duzen River to the powerline crossing above Little Larribee Creek	Scenic	Fish
Van Duzen River to the powerline crossing above Little Larribee Creek	Van Duzen River to the confluence with the Eel River	Recreational	Fish

Source: National Wild and Scenic Rivers System 2024

Notes: ORV – Outstandingly Remarkable Value

Table 3.3.10-2. U.S. Forest Service visual quality objectives standards and guidelines.

Standards	Guidelines
Preservation VQO	Manage wilderness with an emphasis on ecological processes, but allow for activities with low visual impacts, such as trails and trail-related improvements that are well-sited for maximum blending into the landscape. Manipulation of vegetation should appear to be natural within a year.
Retention VQO	**Foreground Distance Zone** – Manage vegetation for diversity of species common to the area, with a range of ages and site classes up to and including trees with old-growth characteristics. Normally, timber harvest openings will be limited to 1 acre. Uneven-aged silvicultural systems and special cutting methods are permitted. Impacts of management activities in highly visible foreground areas will be reduced through special treatments such as leaving residual vegetation, screening, reshaping timber harvest units, and disposing of logging slash. **Middleground Distance Zone** – Manage vegetation with a range of ages and size classes. Even-aged, uneven-aged, and special cutting may be applied. Normally, timber harvest openings will be limited to 10 acres; they will be screened and/or reshaped as necessary to maintain the characteristics of the natural landscape.
Partial Retention VQO	**Foreground Distance Zone** – Manage vegetation for a diversity of species common to the area, with a range of ages and size classes up to and including mature timber. Normally, timber harvest openings will be limited to 5 acres. Even-aged, uneven-aged, and special cutting may be applied. Impacts of management activities in highly visible foreground areas will be reduced through special treatments, as mentioned above in the discussion for the Retention VQO. **Middleground Zones** – Manage vegetation with a range of ages and size classes. In addition to visually sensitive areas, this VQO applies to late-successional reserves, former Rare II areas not allocated to the backcountry prescription, and areas designated as semi-primitive recreation opportunity areas. Other management and resource constraints on these areas will be more restrictive, and management for a Partial Retention VQO should not hinder management of these areas.
Modification VQO	**Foreground Distance Zone** – Manage vegetation with a range of ages and including small timber (size class 3). Normally, timber harvest opening will be limited to 20 acres. **Middleground and Background Distance Zones** – The even-aged silvicultural system will be applied.

Source: USFS-MNF 1995

Boundaries of a scenic corridor are determined by the visible landscape as defined by topography, vegetation, viewing distance, and/or jurisdictional lines. Map 3.3.10-1 shows the locations of identified State Scenic Highways in the Project vicinity.

California W&SR System. The California W&SR Act was passed in 1972 and is intended to complement the National W&SR System in preserving designated rivers that possess extraordinary features.[2] Like the National W&SR System, under the California W&SR Act, river segments can be classified as "wild river areas," "scenic river areas," or "recreational river areas" depending on the level of development surrounding that segment. The classifications represent the existing level of shoreline development and are not a description of any particular extraordinary values identified for the potential or designated river segment. In other words, a classification of scenic means that the river segment is largely undeveloped; it does not mean that the river segment has a Scenery ORV designation. The Eel River and its major tributaries, including its tributary the Van Duzen River, is protected under the California W&SR Act (State Water Resources Control Board 2017).

Regional Regulations

Lake County General Plan. The Open Space, Conservation, and Recreation Element of the Lake County General Plan includes goals and policies related to aesthetic resources that may be applicable to the Project (Lake County 2008). The relevant policies are copied below:

- **Goal OSC-2.** To preserve and protect existing viewsheds and visual quality found in the County.
- **Policy OSC-2.8: Scenic Viewpoints Along Roadways, Bikeways, and Pedestrian Trails.** Scenic viewpoints along roadways and multi-use trails should be provided where there are major views of specific features, such as Clear Lake, Mt. Konocti, or panoramic views of the countryside. Interpretative information should be provided at these points to help inform visitors and residents of the natural and cultural history of the county.
- **Policy OSC-2.11: Grading Impacts.** Humanmade slopes should be revegetated to reflect natural hillside conditions in the surrounding area, to the extent feasible and in accordance with the county's Grading Ordinance.
- **Policy OSC-2.15: Ridgeline Protections/Hilltop Protections.** The county shall develop an ordinance that provides guidelines for development on or near ridgelines and hilltops.

Mendocino County General Plan. The Resource Management Element of the Mendocino County General Plan includes goals and policies related to visual resources (Mendocino County 2020). The relevant policies are copied below:

- **Goal RM-14, Visual Character:** Protection of the visual quality of the County's natural and rural landscapes, scenic resources, and areas of significant natural beauty.

[2] A comparison between the National W&SR Act and the California W&SR Act is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/FOTR/for_28.pdf.

- **Policy RM-130:** Support land trusts and similar organizations in identifying and protecting lands and corridors with significant resource, recreational or scenic values.
- **Policy RM-131:** Protect the scenic values of the county's natural and rural landscapes, scenic resources, and areas of significant natural beauty.
- **Policy RM-133:** Protect the outstanding values of designated river corridors within the State Wild and Scenic River System by limiting land use and site development impacts (including grading and vegetation removal but not including regulated timber harvesting).
- **Policy RM-134:** Lakes, stream corridors, large reservoirs, and other water bodies have scenic values that shall be maintained or enhanced and restored when necessary.
- **Policy RM-135:** Maintain and enhance scenic values through development design principles and guidelines, including the following:
  - Development scale and design should be subordinate to and compatible with the setting.
  - Reduce the visual impacts of improvements and infrastructure.
  - Minimize disturbance to natural features and vegetation but allow selective clearing to maintain or reveal significant views.

3.3.10.4 Scott Dam Area

Scott Dam is a concrete structure that spans the width of the Eel River with a maximum height of 130 ft and a total length of 805 ft. Lake Pillsbury, created by Scott Dam, is the main storage reservoir of the Project. Lake Pillsbury is primarily on private property owned by PG&E and also within the boundaries of the MNF. With a surface area of approximately 1,875 acres under normal operating conditions with the gates open, and 29 miles (mi.) of shoreline (PG&E 2015), Lake Pillsbury is the largest lake in the MNF.

Lake Pillsbury provides a variety of reservoir-based recreation opportunities such as boating, wind surfing, fishing, and swimming. A variety of developed recreation facilities are in the immediate vicinity of Lake Pillsbury, including family campgrounds, group campgrounds, and day-use facilities, are available to the public (Map 3.3.10-2). The Project recreation facilities are operated and maintained by a recreation management company though a concessionaire agreement with PG&E. However, private recreation resorts, boat launches, day use facilities, and campgrounds provide overnight and day-use opportunities. In addition, the Lake Pillsbury area serves as a base for off-highway vehicle use and provides non-Project recreational opportunities for a variety of vehicle types, including motorcycles, all-terrain vehicles, dune buggies, side-by-sides, and 4×4s. Refer to Section 3.3.9 for additional information related to recreational resources in the Project vicinity.

The full-pool elevation of Lake Pillsbury provides views of large conifers and lower chaparral-type vegetation along the shoreline, surrounded by gradual to steep slopes. Typically, in the early June through July period, the lake level starts to draw down due to water releases to meet regulatory instream flow requirements and to support contractual water delivery requirements to the Potter

Valley Irrigation District. Over 500 acres of dewatered lakebed is exposed during this time (Federal Energy Regulatory Commission [FERC] 1978). The visual effect of the dewatered zone varies, depending upon the location from which the drawdown is observed and upon the elevation and position of the location, the time of day, and the length of time and frequency of the observation. During low water, features such as submerged trees and rocky outcrops within the lakebed, as well as the "bathtub ring" around the reservoir, may be dominant components of the visual experience. Under the current operation, full-pool conditions do not occur because the maximum water surface elevation is maintained at 10 ft. below full pool to ameliorate seismic risk. Therefore, under the current existing condition, the upper 10 ft. of shoreline is exposed. In general, the visual character of the Scott Dam Area may be defined as a forested landscape surrounding a central lake area with interspersed recreational facilities, minor roadways, and rural residences.

The Scott Dam Area is located within Lake County and the MNF. As a result, the area is subject to the Lake County rules and regulations described above, and to the goals, objectives, directives, and prescriptions contained in the MNF LRMP. USFS direction pertaining to visual resources in the vicinity of Lake Pillsbury is summarized below.

Wild and Scenic River Designations

The Scott Dam Area does not include any river segments that are included in the National or California W&SR systems (National W&SR System 2024).

Scenic Corridors

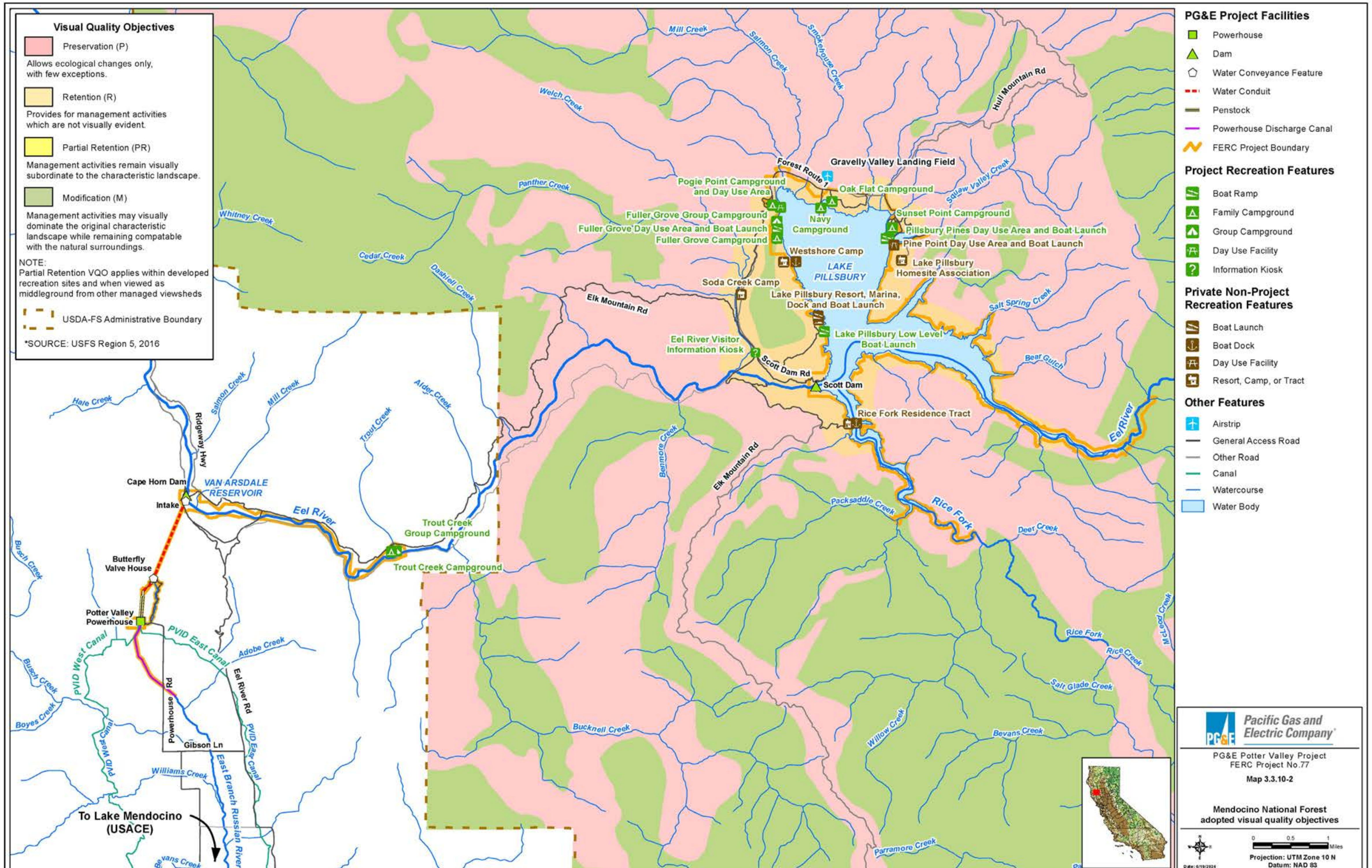
There are no state-designated scenic highway segments in the Scott Dam Area (Caltrans 2024). In addition, the Lake County General Plan does not identify any specific scenic corridors (Lake County 2008).

Mendocino National Forest Land and Resource Management Plan

As noted above, USFS protects aesthetic resources by establishing VQOs. The VQOs define theoretically acceptable limits of visual modification for particular areas within USFS lands and classify areas according to their degree of inherent scenic attractiveness, visual variety, and viewer sensitivity level. The VQO classifications for the region surrounding Lake Pillsbury, as established in the MNF LRMP, are presented in Map 3.3.10-2. In general, the shoreline area surrounding Lake Pillsbury is designated as Retention VQO. Lands beyond the immediate shoreline are designated as Preservation and Modified VQOs.

3.3.10.5 Cape Horn Dam Area

Water captured and stored in Lake Pillsbury is released into the Eel River and then captured in Van Arsdale Reservoir, which is the reservoir formed behind Cape Horn Dam (PG&E 2015). The reservoir has a surface area of approximately 106 acres at the normal maximum water surface elevation of 1,494.3 feet. Van Arsdale Reservoir behind Cape Horn Dam is operated as a run-of-river reservoir and is kept at full pool. Fluctuations in reservoir elevation occur as a result of different flow levels in the Eel River, but not as a function of reservoir storage operations. The reservoir provides the elevation head required to divert water through the Van Arsdale Intake. Cape Horn Dam is 520 ft. long and consists of two main sections: an earth fill section and a concrete gravity overflow spillway section. At Cape Horn Dam, there is a pool-and-weir-type fish ladder that provides fish passage over the dam, allowing fish to utilize the Eel River and its tributaries between Cape Horn and Scott dams.



Map 3.3.10-2. Mendocino National Forest adopted visual quality objectives.

This Page Intentionally Left Blank

The ladder is roughly U-shaped, with one end opening at the west end of the dam crest and the other end opening into the river approximately 80 ft. downstream from the toe of the dam.

At Van Arsdale Reservoir, water is diverted and conveyed to the Potter Valley Powerhouse, located just north of predominantly agricultural Potter Valley. The Potter Valley Powerhouse building is a steel-frame structure, approximately 101 ft. long by 53 ft. wide, containing three generating units. The three generating units discharge into individual concrete channels, joining together into a common channel approximately 60 ft. downstream from the powerhouse. The Potter Valley Powerhouse Switchyard is located adjacent to the powerhouse.

The visual character of the Cape Horn Dam Area varies. Along the Eel River and Van Arsdale Reservoir, views afforded to motorists include conifers and chaparral-type vegetation, rural residences, and agricultural fields, and intermittent views of the waterway. The southwestern portion of the Cape Horn Dam Area is more developed, and public views are characteristic of a small agricultural town.

The Cape Horn Dam Area is located outside the MNF, entirely within Mendocino County, and, as a result, the area is subject to Mendocino County rules and regulations described above.

Wild and Scenic River Designations

As summarized in Table 3.3.10-1, the Eel River segment beginning at Cape Horn Dam to Tomki Creek is classified as a recreation river segment, meaning it contains some form of impoundment and is readily accessible. The ORV is Fish (National W&SR System 2024).

Scenic Corridors

There are no designated scenic highway segments in the Cape Horn Dam Area (Caltrans 2024). Additionally, the Mendocino County General Plan does not identify any specific scenic corridors (Mendocino County 2020).

3.3.10.6 Eel River Watershed

The primary Project facilities (dams, reservoirs, and diversion facilities) are located along the Eel River, and the Eel River Watershed includes the entire Scott Dam Area as well as the northeastern portion of the Cape Horn Dam Area (see Map 3.3.10-1). The Eel River Watershed is located entirely in the Northern Coast Range and is characterized by steep and heavily forested terrain with minimal development. The forest is dominated by mixed conifer stands, including ponderosa and Jeffrey pines, sugar pine, Douglas-fir, white fir, and incense cedar (USFS-MNF 1995).

The Eel River Watershed and sub-watersheds are depicted in Map 3-2 (in Section 3.2). The Eel River Watershed covers a large area in Lake County, Mendocino County, Glenn County, Humboldt County, and Trinity County and includes portions of the MNF. As a result, portions of the Eel River Watershed are subject to various county regulations, as well as the MNF VQO standards in areas under USFS jurisdiction.

Wild and Scenic River Designations

The Eel River from 300 ft. below Cape Horn Dam to the mouth at the Pacific Ocean is designated as a National W&SR. As summarized in Table 3.3.10-1, classifications vary by segment, with one section beginning at Tomki Creek classified as scenic, meaning it is generally free of impoundments with some accessibility. The ORV for all of the segments on the mainstem of the Eel River is Fish. The Scenery ORV does not apply to any segment on the mainstem of the Eel River.

Segments of the Eel River and its tributaries included in the National W&SR System are also included in the California W&SR System and are protected under the California W&SR Act of 1972 (Public Resources Code §§ 5093.50–5093.70).

Scenic Corridors

As depicted on Map 3.3.10-1, portions of Highway 101 and Highway 20 that extend through the Eel River Watershed are eligible for designation as scenic highway segments (Caltrans 2024).

3.3.10.7 Russian River Watershed

This discussion focuses on the northernmost portion of the Russian River Watershed where the Project is located. The southwestern portion of the Cape Horn Dam Area, including the Potter Valley Powerhouse, is located on the East Branch Russian River, in the northern Russian River Watershed (see Map 3.3.10-1).

The watershed is rural in character and features year-round river flow and hilly or mountainous terrain in the upper reaches. Irrigated agriculture, including orchards and vineyards, is found in the Project vicinity. The northern portion of the Russian River Watershed is subject to Mendocino County regulations.

Wild and Scenic River Designations

No part of the Russian River, including the East Branch Russian River, is included in the National or State W&SR systems (National W&SR System 2024).

Scenic Corridors

The Mendocino County General Plan does not identify any specific scenic corridors (Mendocino County 2020). However, as depicted on Map 3.3.10-1, the portions of Highway 101 and Highway 20 that extend through the northern Russian River Watershed are eligible for designation as scenic highway segments (Caltrans 2024).

3.3.10.8 References

Caltrans (California Department of Transportation). 2024. California state scenic highway system map. Available at: https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa. Accessed May 2024.

FERC (Federal Energy Regulatory Commission). 1978. Potter Valley Project No. 77-California, Applicant Pacific Gas and Electric Company. December.

Lake County. 2008. Lake County general plan, open space, conservation, and recreation element. Available at: https://www.lakecountyca.gov/DocumentCenter/View/1640/Chapter-9---Open-Space-Conservation-and-Recreation-PDF. Accessed June 2024.

Mendocino County. 2020. Mendocino County general plan, resource management element. Available at: https://www.mendocinocounty.gov/home/showpublisheddocument/54487/638055061981600000. Accessed June 2024.

National Park Service. 2011. Wild and Scenic Rivers Program fact sheet: outstandingly remarkable values. Available at: https://www.nps.gov/orgs/1912/upload/ORV_9_2011.pdf. Accessed June 2024.

National Wild and Scenic Rivers System. 2024. California. Available at: https://www.rivers.gov/california. Accessed June 2024.

PG&E (Pacific Gas and Electric Company). 2015. Form 80 recreation use reports for the Van Arsdale Reservoir and Lake Pillsbury Developments.

State Water Resources Control Board. 2017. The California Wild & Scenic Rivers Act. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/FOTR/for_28.pdf. Accessed June 2024.

USFS-MNF (U.S. Forest Service, Mendocino National Forest). 1995. Mendocino National Forest Land and Resource Management Plan. February. Available at: https://www.fs.usda.gov/detailfull/mendocino/landmanagement/planning/?cid=fsbdev3_004518. Accessed June 2024.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Maps

List of Acronyms

BP	Before Present
Cal BP	Calibrated years before the present
Caltrans	California Department of Transportation
CCRD	Confidential Cultural Resources Database
CFR	Code of Federal Regulations
FERC	Federal Energy Regulatory Commission
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
PVID	Potter Valley Irrigation District
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SA	Study Area
SHPO	State Historic Preservation Officer
Snow Mountain Co.	Snow Mountain Water and Power Company
USFS	U.S. Forest Service

3.3.11 Cultural Resources

The term "cultural resources" refers to built-environment resources (e.g., buildings, structures, objects, districts, landscapes) and archaeological resources. This section describes the existing environment for cultural resources within Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project) cultural resources study areas (SA). Included in this section are (1) a brief pre-European contact cultural chronology and historical overview of the area within and surrounding the Federal Energy Regulatory Commission (FERC) Project boundary; (2) a description of the three SAs for cultural resources: the FERC Project Boundary Cultural Resources SA, the Eel River SA, and the East Branch Russian River SA; (3) a summary of previous cultural resources studies; and (4) an inventory of previously recorded built-environment and archaeological resources that have been evaluated or require evaluation for listing in the National Register of Historic Places (NRHP).

3.3.11.1 Information Sources

The following sources were used in preparing this section:

- PG&E's Confidential Cultural Resources Database (CCRD);
- *Potter Valley Hydroelectric Project FERC Project No. 77 Relicensing Pre-Application* (PG&E 2017);
- Preliminary archaeological inventory of the area within the FERC Project boundary conducted by Browning Cultural Resources, Inc. prior to January 2019; on January 25, 2019, PG&E filed a notice with FERC stating they would no longer be relicensing the Project, and the inventory was not completed (PG&E 2019a);
- Preliminary built-environment inventory of the area within the FERC Project boundary conducted by Cardno, Inc. prior to January 2019; on January 25, 2019, PG&E filed a notice with FERC stating they would no longer be relicensing the Project,[1] and the inventory was not completed (PG&E 2019b);
- California Department of Transportation (Caltrans) Statewide Historic Bridge Inventory Update (Caltrans 2006);
- California Register of Historical Resources (Office of Historic Preservation 2024a);
- *Five Views: An Ethnic Historic Site Survey for California* (Office of Historic Preservation 1988);
- Built Environment Resources Directory (Office of Historic Preservation 2024b);
- California Historical Landmarks (Office of Historic Preservation 2024c); and
- California Points of Historical Interest (Office of Historic Preservation 2024d).

[1] FERC Accession No. 20190125-5100.

3.3.11.2 Cultural Resources Study Areas[2]

In addition to the FERC Project Boundary Cultural Resources SA, the downstream reaches of the Eel and Russian rivers were included as SAs in the evaluation of the affected environment for cultural resources to account for the potential effects of sediment flows from dam removal.

The boundaries of the three cultural resources SAs are described below and depicted in Maps 3.3.11-1 through 3.3.11-3:

- The FERC Project Boundary Cultural Resources SA encompasses the FERC Project boundary and a 0.5-mile buffer (Map 3.3.11-1).
- The Eel River SA encompasses the Eel River downstream of Scott Dam to the Pacific Ocean including the Eel River estuary (the SA ends at the Pacific Ocean at the estuary because any sediments from dam removal will be flushed and deposited in the river prior to reaching the estuary mouth) and a 0.5-mile buffer on either side of the Eel River (Map 3.3.11-2).
- The East Branch Russian River SA encompasses the East Branch Russian River to Lake Mendocino plus a 0.5-mile buffer on either side of the East Branch Russian River (Map 3.3.11-3).

3.3.11.3 Pre-European Contact Archaeological Cultural Chronology[3]

The following summarizes the general regional evolution of pre-European contact cultures through time. This summary is adapted from the Archaic-Emergent temporal sequence developed by Fredrickson (1974) and Hildebrandt et al. (2018), which summarizes chronologies researchers have developed over the past 50 years informed by archaeological dating technology and archaeological field data regarding the nature of Native California occupation during the pre-European contact period. It consists of a sequence of four periods, described in the following subsections.4

Paleoindian Period (13400–10000 cal [BP])

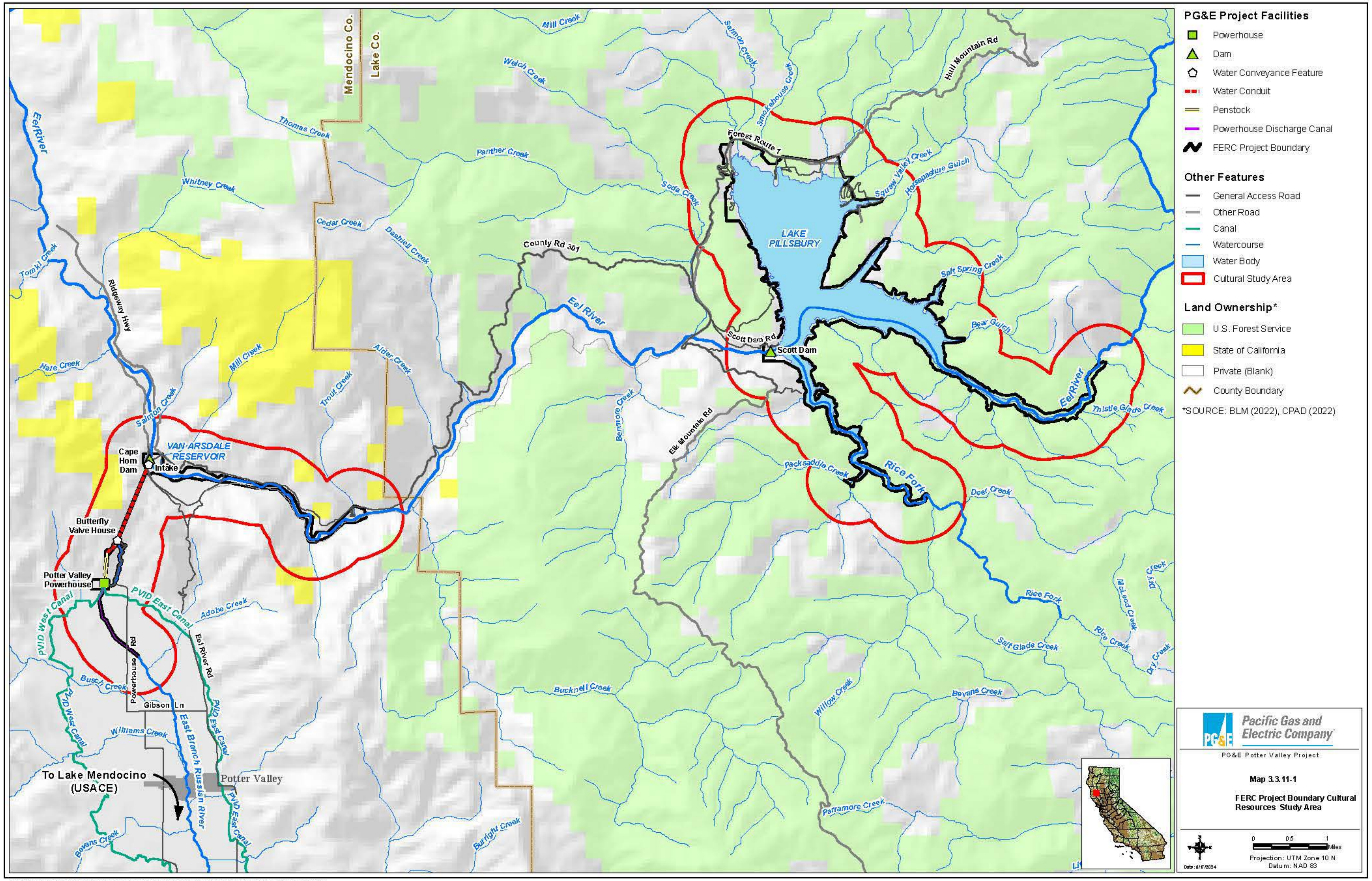
Until relatively recently, most archaeologists believed that artifacts produced by Clovis people represented the oldest evidence of human occupation in North America. These artifacts typically include fluted projectile points, large bifaces, and a variety of formal flake tools. However, there is one purported pre-Clovis site located near Northern California in south-central Oregon, located in the northwestern Great Basin on the margins of Summer Lake Basin, about 75 kilometers north of Lakeview, Oregon.

---

2 An area of potential effects pursuant to 36 Code of Federal Regulations § 800.16(d) has not yet been defined. It will be developed in consultation with FERC, stakeholders, and the State Historic Preservation Officer as part of compliance with Section 106 of the National Historic Preservation Act.

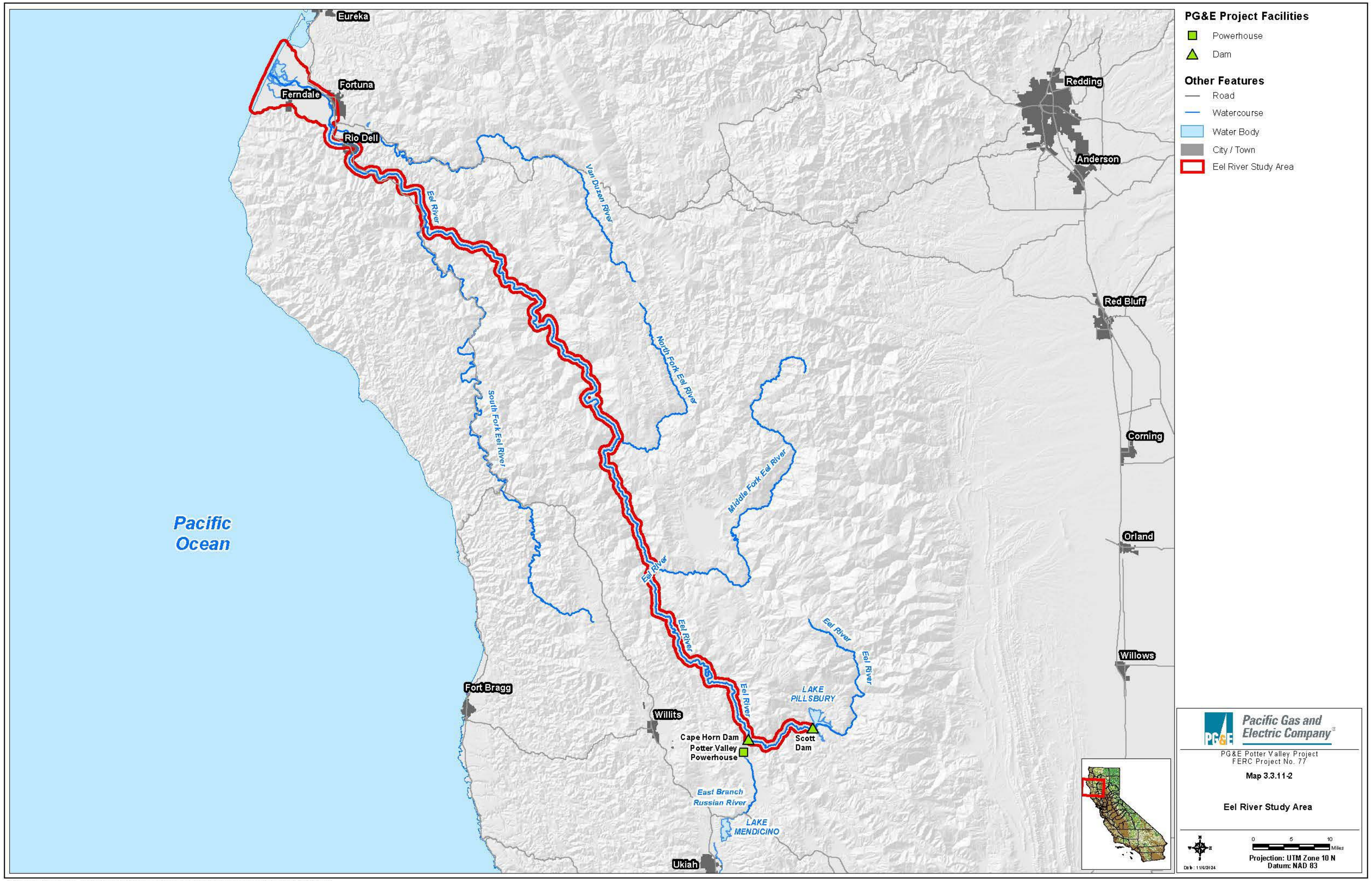
3 The term “pre-European contact” as used here is synonymous with the term “prehistory,” meaning the time prior to European contact with Indigenous groups of California. The term is used to avoid pejorative implications.

4 These phases are academic constructs and do not necessarily reflect the views of Indigenous groups of California.



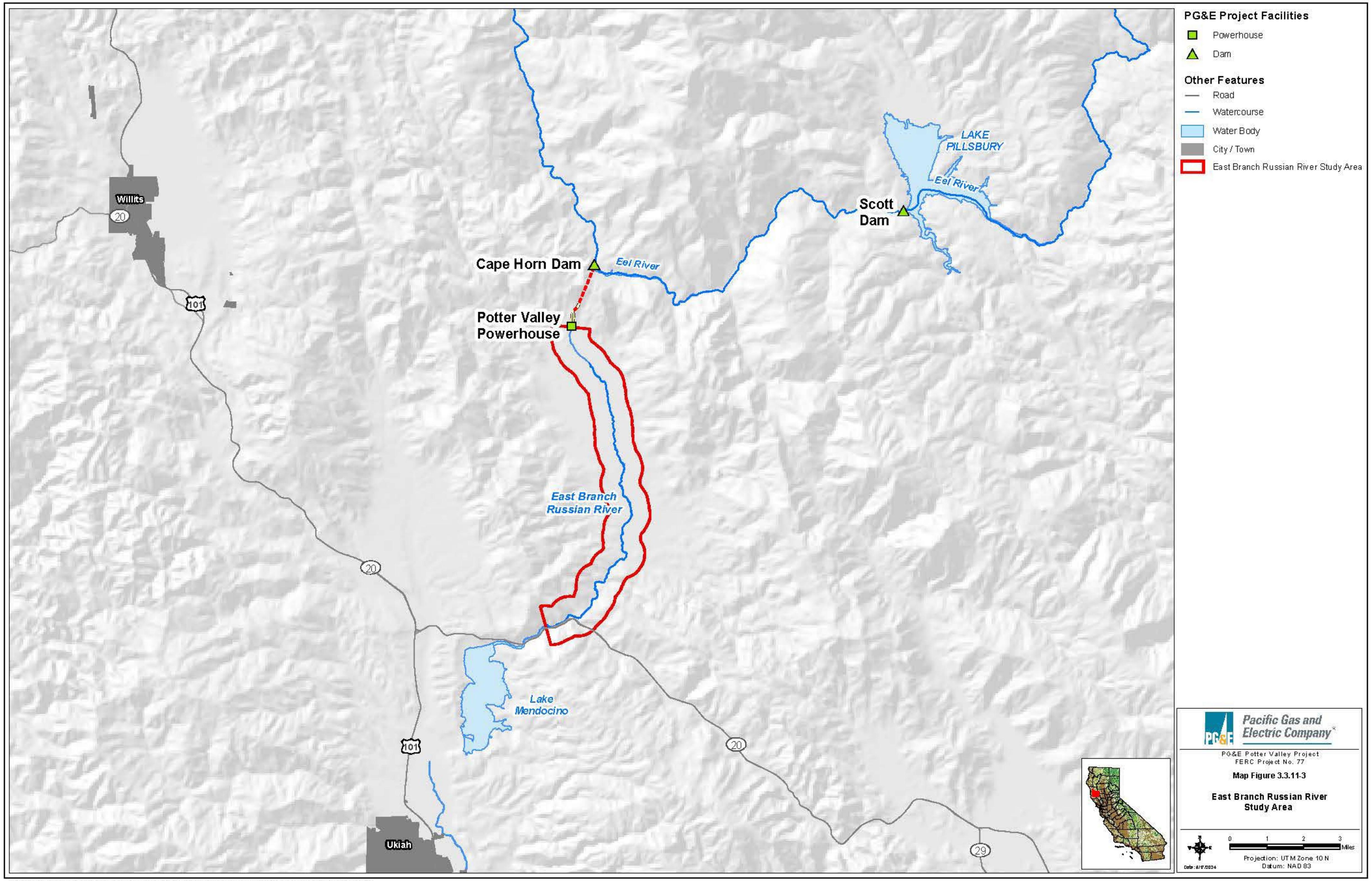
Map 3.3.11-1. FERC Project Boundary Cultural Resources Study Area

This Page Intentionally Left Blank



Map 3.3.11-2. Eel River Study Area

This Page Intentionally Left Blank



Map 3.3.11-3. East Branch of Russian River Study Area.

This Page Intentionally Left Blank

The site is a deep stratified deposit that includes a lower component dating from about 14500 to 14100 calibrated years before present (cal BP [12400 to 12200 radiocarbon years before present]), which pre-dates the earliest estimates for Clovis by 800 years. This component includes Pleistocene megafauna, as well as bifaces, debitage, cordage, butchered bone, and human coprolites, the latter documented by the presence of human DNA. Multiple radiocarbon dates were obtained from the human coprolites (Hildebrandt et al. 2018).

Lower Archaic/Borax Lake Pattern (10000–6300 cal BP)

The Lower Archaic Period is characterized by the predominance of millingstone adaptation. Artifact assemblages appear to represent a mobile forager pattern of subsistence-settlement organization (Fredrickson 1974, 1994). Archaeological manifestations the Borax Lake Pattern have been discovered and studied throughout the interior of northwest California. Borax Lake Pattern sites extend from the Clear Lake Basin north into Humboldt and Trinity counties, with many located in upland habitats. The earliest Borax Lake Pattern materials dating between 10000 and 8500 cal BP are limited to flaked stone artifacts, including large, wide-stemmed points (square bases, some with fluting), ovoid flake tools, and thin bladelet flakes (Hildebrandt et al. 2018).

Middle and Upper Archaic/Mendocino Pattern (5000–1500 cal BP)/Houx Aspect of the Berkeley Pattern (3200–1200 cal BP)

The Middle Archaic Period is generally marked by the introduction of mortar and pestle technology and the assumed exploitation of acorns. Hunting appears to have become significantly more important compared with the Lower Archaic Period. Economic diversification and sedentism began to develop, accompanied by population growth and expansion (Fredrickson 1974, 1994).

An environmental change, with climate becoming generally cooler, marked the shift from the Middle to Upper Archaic periods, and lifestyles became more sedentary. Subsistence strategies shifted to focus on intensive processing and storage. Numerous small villages and the beginnings of a more complex society and economy characterize the end of this period (Fredrickson 1994).

The assemblages assigned to the Mendocino Aspect include chert-dominated side-notched, corner-notched, and concave-based dart points, handstones, and millingslabs; various types of flake tools and cobble tools; and, in some cases, a limited number of cobble mortars and pestles. Mendocino Aspect sites rarely have midden deposits or burials and appear to represent continuity of a residentially mobile adaptation through the Middle and Upper Archaic (Hildebrandt et al. 2018).

Artifact assemblages of the Houx Aspect of the Berkeley Pattern are elaborate and include leaf-shaped (Excelsior) and stemmed projectile points, bone tool industry, many fishing-related implements (spears, harpoons, hooks, net sinkers), baked clay objects (including a few fragments of pottery), and a relatively high frequency of mortars and pestles. Basketry impressions obtained from baked clay, combined with changes in bone awl technology, appear to be linked to production of more varied types, ranging from tightly woven forms to loose-weave burden baskets. Site structure is also quite formalized and includes black midden deposits, well-defined house floors, and a variety of other residential features. This higher degree of sedentism appears to be based on a subsistence economy built around the intensive use of acorns, large terrestrial game, and fish (Hildebrandt et al. 2018).

Emergent Period/Augustine Pattern (1200 cal BP–Contact)

The Emergent Period represents the ethnographically documented cultures present at the time of European contact. Settlement patterns during the Emergent Period were based on the development of large central villages serving as political and economic centers, smaller associated villages, and specialized activity areas, status ascription, and social stratification observed in burial practice. New technology was also introduced during this period, notably the bow and arrow, which is evidenced in the archaeological record by small, dart-sized projectile points.

Archaeological sites dating to this period are common throughout the Northern Coast Range and include ritual sites, rock art panels, an increased occurrence of milling equipment (such as mortars and pestles), and moderate/large occupation sites marked by midden soils, dietary bone and shell, and a wide range of artifact types and marine shell beads suggesting a wide-ranging exchange system (Fredrickson 1974, 1994; King et al. 2016). These new artifacts were used as a medium of monetized exchange until Euro-American contact, representing social and economic integration previously unseen in the archaeological record for California.

The Augustine Pattern is represented by bow-and-arrow technology, shaped mortars and pestles, advanced fishing implements including harpoons, charmstones, *Olivella* sequin beads, clam shell disk beads, shell and steatite ornaments, tubular pipes, and large village sites composed of house pits, large semisubterranean dance houses and sweat lodges, and human burials.

See Section 3.3.12 Tribal Resources for the ethnographic, ethnohistoric context, and information on California Tribal groups known to have cultural ties or other interests in the vicinity of the Tribal resources SAs: FERC Project boundary, Eel River and East Branch of the Russian River.

3.3.11.4 Historical Overview

Mendocino was one of California's original 27 counties, delineated in 1850 by the California legislature. Although Russian and American trapping expeditions likely traveled through the present-day Potter Valley region beginning in the early nineteenth century, the first non-native people known to have settled in the general area were Sonoma County residents William and Thomas Potter and Mose Briggs. They first entered what would become known as Potter Valley in 1852, searching for the headwaters of the Russian River. While they established claims to lands within the valley, they did not settle there until 1853. By 1858, a number of families had established ranches in the area, and a sawmill was built to provide lumber for construction to a growing population. During most of the 1850s, the Potter Valley area and all of Mendocino County were subject to Sonoma County oversight since the population of Mendocino was considered too small to warrant its own government. However, by 1859, Mendocino County's population grew to a size that could support its own governing body, and the county seat was officially established in Ukiah.

Agricultural production, ranching, mining, and logging of the vast coastal redwood and fir stands constituted the foundation of Mendocino County's economy throughout the latter decades of the 1800s. A mining district was established in Potter Valley in 1863, although it never was a major producer of gold or other minerals. The county's greatest and longest-lasting resource has been its farming and ranching assets. Potter Valley today is a rich agricultural region with excellent soils, planted mostly in irrigated pastures, vineyards, and orchards (pears). Potter Valley supports many diverse farms and livestock ranches.

Lake County's land use and historical development is similar to Mendocino County's. While not one of California's original counties, Lake County was established early in California's history. In May of 1861, Lake County was formed by taking portions of surrounding Napa, Mendocino, and Colusa counties. Lakeport was designated as the county seat. Euro-American settlement had been growing steadily for several years, and farms, orchards, and ranches were well established along with a significant mining industry exploiting mercury, gold, and borax deposits.

During the 1860s, ranchers moved sheep, cattle, horses, and goats into the mountains in northern Lake County. Most of the grazing was seasonal, with herders intentionally burning the lush meadows in the late fall to encourage heavy spring grass growth. The first known Euro-American settlers, the McMath brothers in the present-day Lake Pillsbury area, obtained federal homestead patents in the 1860s. This led to the establishment of a thriving community. Roads were built into the once-remote region, and by the late 1860s the "town" of Gravelly Valley was well established. In later years, a shake (wood shingle) mill and a general store were built, along with a blacksmith shop, post office, hotel, and school. During the 1880s, the name of the settlement changed to Hullville. The exact location of the town is uncertain, but it was generally situated near the confluence of the Rice Fork of the Eel River and the Eel River, which is now under water in Lake Pillsbury.

Early Hydroelectric Generation History

Agriculture, lumber, mining, and other industries significantly contributed to the economic growth of Mendocino County. In addition, the development of hydroelectric power generation was a notable occurrence during the late-nineteenth and early-twentieth centuries. As technology evolved, transmission of electricity over hundreds of miles supported and made possible rapid commercial, residential, and infrastructure development. Engineering firms such as J.G. White & Company of New York, Byllsley & Company of Chicago, Ford, Bacon & Davis of New York, and others established offices in San Francisco and began power projects throughout Northern and Central California. During this time, local municipalities acquired water rights on major rivers for the purpose of developing hydroelectric power generation projects. One of these was the town of Ukiah, whose quest for electric power led to the development of the Potter Valley Hydroelectric Project.

Potter Valley Hydroelectric Project

In 1905, San Francisco entrepreneur and Mendocino County landowner W.W. Van Arsdale devised a plan to divert water from the Eel River to a hydroelectric power plant in Potter Valley in the Russian River Watershed. He proposed that if the town of Ukiah would agree to pay $1,000 a month for a set number of years, he would build the power plant and furnish continuous current 24 hours a day. The agreement that was reached between Ukiah and Van Arsdale led to the development of the Eel River Project.

George W. Scott of San Francisco, Van Arsdale's partner, and six other investors from San Francisco and Mendocino County incorporated the Eel River Power and Irrigation Company in February 1905. The company began work on the Eel River Project's first dam at Cape Horn within a few months. While the reservoir site was being cleared, construction crews worked on the powerhouse, a substation at Talmadge (just southeast of Ukiah), and a transmission line into Ukiah. The powerhouse went into operation on April 1, 1908, energizing the line to Ukiah that same day. To acquire additional funding, the Eel River Power and Irrigation Company was reorganized in February 1906, incorporating as the Snow Mountain Water and Power Company (Snow Mountain Co.). Additional backing from new investors Senator Charles N. Felton and E.S. Pillsbury raised the company's operating capital from $500,000 to $5 million.

Following the completion of the powerhouse, additional transmission and distribution lines were constructed throughout the area. By 1920, Van Arsdale Reservoir had silted to the point of reducing summer flow through a tunnel. In response, construction began on Scott Dam, 12 miles upstream from the tunnel. Stone & Webster, a Chicago-based construction firm, completed Scott Dam in 1921 and inundated the site of the town of Hullville (Gravelly Valley). The reservoir created by Scott Dam greatly increased storage capacity for the Potter Valley Powerhouse and led to year-round operation.

Along with power, water sales were a consideration in the construction of Van Arsdale Reservoir and Lake Pillsbury. With a reliable source of water from the Eel River, the Potter Valley Irrigation District (PVID) was formed, and an agreement was reached between Snow Mountain Co. and the PVID to supply water to farmlands in the valley. Two main irrigation canals were constructed down the east and west sides of Potter Valley.

PG&E purchased Snow Mountain Co.'s assets in 1930. With the exception of alterations to the exterior of the powerhouse and various upgrades to improve system efficiency and reliability, in general, the overall electrical power generation system remains largely unchanged since its original construction.

3.3.11.5 CCRD Records Search and Information Sources Review

In June of 2024, a records search of PG&E's CCRD was conducted to identify cultural resources and studies within the FERC Project Boundary Cultural Resources SA, Eel River SA, and East Branch Russian River SA. The CCRD is a geospatial database of cultural resources records and reports maintained by PG&E. In addition to the CCRD, the inventories listed in Section 3.3.11.1 were reviewed for the three cultural resources SAs.

Previous Studies

The records search of PG&E's CCRD identified 905 cultural resources studies conducted within the three cultural resources SAs dating from 1965 to 2024. A total of 129 studies have been conducted within the past 20 years (2005–2024) within the FERC Project Boundary (15 studies), Eel River (161 studies), and East Branch Russian River (9 studies) SAs. The locations of recent studies (2005–2024) are depicted in Appendix 3.3.11-A, Maps 3.3.11-A-1 through 3.3.11-A-3 and the studies are listed in Tables 3.3.11-A-1, 3.3.11-A-2, and 3.3.11-A-3.

Previously Recorded Resources

The records search of PG&E's CCRD identified 246 previously recorded resources—79 built-environment resources and 167 archaeological resources. The resources within each of the SAs are described below. Due to slight overlaps in the FERC Project Boundary Cultural Resources SA with the Eel River and East Branch Russian River SAs, some resources are mapped within more than one SA. However, these are only listed once in the previously recorded resource tables for the FERC Project Boundary Cultural Resources SA.

FERC Project Boundary Cultural Study Resources Study Area

The CCRD records search and information sources review identified 70 previously recorded resources within the FERC Project Boundary SA, the locations of which are shown in Maps 3.3.11-4a–d. They are listed in Tables 3.3.11-1 and 3.3.11-2 below.

This Page Intentionally Left Blank

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of sensitive cultural resources and qualify as Confidential Information (36 Code of Federal Regulations [CFR] Section 800.11[c][1]).[5] Disclosure of such information could result in damages to archaeological and other heritage resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.11-4a–d. CONFIDENTIAL Previously Recorded Resources within the FERC Study Area

The maps identified above are included in Volume IV, Exhibit E Privileged Information—Cultural Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

5 The legal authority to restrict cultural resources information is in Section 304 of the National Historic Preservation Act of 1966, as amended. Furthermore, California Government Section Code 6254.10 exempts archaeological sites from the California Public Records Act, which requires that public records be open to public inspection.

This Page Intentionally Left Blank

Table 3.3.11-1. Previously recorded built-environment resources in the FERC Project Boundary Cultural Resources Study Area.

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**Location**	**NRHP Evaluation Status**
P-17-002427 No trinomial 05-08-54-0647	Historic-period built-environment	Swallow Rock Organization Camp/Cabin	Within FERC Project boundary	Unevaluated
P-17-002490 No trinomial No USFS number	Historic-period built-environment	Scott Dam	Within FERC Project boundary	Not eligible
P-23-001998 CA-MEN-2274H No USFS number	Historic-period built-environment	Cape Horn Dam (Van Arsdale Dam)	Within FERC Project boundary	Re-evaluation required
P-23-004695 No trinomial No USFS number	Historic-period built-environment	Potter Valley Powerhouse & Penstocks	Within FERC Project boundary	Not eligible
P-23-005838 No trinomial No USFS number	Historic-period built-environment	Potter Valley Penstock	Within FERC Project boundary	Recommended not eligible
P-17-002980 CA-LAK-2288H No USFS number	Historic-period built-environment	Packsaddle Trail	Within FERC Project boundary	Unevaluated
P-17-002985 CA-LAK-2293H No USFS number	Historic-period built-environment	Abandoned main road, includes multiple line segments	Within FERC Project boundary	Unevaluated
P-23-006304 No trinomial No USFS number	Historic-period built-environment	Memorial monument "Billy W. M. Dawson"	Within FERC Project boundary	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**Location**	**NRHP Evaluation Status**
P-23-006305 No trinomial No USFS number	Historic-period built-environment	Memorial monument "Terry Grizzly Adams"	Within FERC Project boundary	Unevaluated
P-17-0029634 CA-LAK-2280H No USFS number	Historic-period built-environment	Historic-period road grade linking Kapronos Road with Scott Dam work area	Within 0.5-mile buffer of FERC Project boundary	Unevaluated

Table 3.3.11-2. Previously recorded archaeological resources in the FERC Project Boundary Cultural Resources Study Area.

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	Location	NRHP Evaluation Status
P-17-001243 CA-LAK-1499 05-08-54-0372	Pre-European contact	Midden with lithic scatter	Within FERC Project boundary	Unevaluated
P-17-001244 CA-LAK-1500/H 05-08-54-0373	Pre-European contact/historic-period	Foundation; lithic scatter	Within FERC Project boundary	Unevaluated
P-17-001245 CA-LAK-1501/H 05-08-54-0374	Pre-European contact/historic-period	Lithic scatter; campground hearths; and road grades	Within FERC Project boundary	Unevaluated
P-17-001260 CA-LAK-1516 05-08-54-0363	Pre-European contact	Lithic scatter	Within FERC Project boundary	Unevaluated
P-17-001261 CA-LAK-1517/H 05-08-54-0371	Pre-European contact/historic-period	Lithic scatter with groundstone; platform feature and refuse concentrations	Within FERC Project boundary	Unevaluated
P-17-002882 CA-LAK-2234H 05-08-54-0668	Historic-period	Oak Flat Campground; campground hearth and concrete slab	Within FERC Project boundary	Unevaluated
P-17-002883 CA-LAK-2235/H 05-08-54-0669	Pre-European contact/historic-period	Pogie Point Campground, campground hearths; lithic scatter	Within FERC Project boundary	Unevaluated
P-17-002884 CA-LAK-2236H No USFS number	Historic-period	Road grade linking Scott Dam Concrete Batch Plant with Scott Dam work area	Within FERC Project boundary	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	Location	NRHP Evaluation Status
P-17-002885 CA-LAK-2237H No USFS number	Historic-period	Structure footings and refuse scatter	Within FERC Project boundary	Unevaluated
P-17-002886 CA-LAK-2238H No USFS number	Historic-period	Structure footing, rock alignments, and refuse deposit	Within FERC Project boundary	Unevaluated
P-17-002975 CA-LAK-2283H No USFS number	Historic-period	Scott Dam south buttress excavation escarpment	Within FERC Project boundary	Unevaluated
P-17-002976 CA-LAK-2284H No USFS number	Historic-period	Foundations and features associated with the Scott Dam Concrete Batch Plant	Within FERC Project boundary	Unevaluated
P-17-002978 CA-LAK-2286 No USFS number	Pre-European contact	Lithic quarry	Within FERC Project boundary	Unevaluated
P-17-002981 CA-LAK-2289 No USFS number	Pre-European contact	Lithic scatter	Within FERC Project boundary	Unevaluated
P-17-002982 CA-LAK-2290H No USFS number	Historic-period	Historic-period camp	Within FERC Project boundary	Unevaluated
P-17-002983 CA-LAK-2291 No USFS number	Pre-European contact	Lithic scatter with chert and obsidian	Within FERC Project boundary	Unevaluated
P-23-000735 CA-MEN-798 No USFS number	Pre-European contact	Housepits, midden, and lithic scatter	Within FERC Project boundary	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**Location**	**NRHP Evaluation Status**
P-23-000754 CA-MEN-817 No USFS number	Pre-European contact	Housepits, midden, and lithic scatter	Within FERC Project boundary	Unevaluated
P-23-000777 CA-MEN-840 No USFS number	Pre-European contact	Midden and lithic scatter	Within FERC Project boundary	Unevaluated
P-23-000778 CA-MEN-841/H No USFS number	Pre-European contact/historic-period	Lithic scatter; orchard, refuse scatter, well, and road grades	Within FERC Project boundary	Unevaluated
P-23-001022 CA-MEN-1099 No USFS number	Pre-European contact	Midden and lithic scatter	Within FERC Project boundary	Unevaluated
P-23-001039 CA-MEN-1117 No USFS number	Pre-European contact	Lithic scatter	Within FERC Project boundary	Unevaluated
P-23-001061 CA-MEN-1155 No USFS number	Pre-European contact	Midden, housepits, groundstone, and lithics	Within FERC Project boundary	Unevaluated
P-23-001656 CA-MEN-1825/H 5085400135	Pre-European contact/historic-period	Lithic scatter with groundstone; historic-period rock walls and cribbed pit	Within FERC Project boundary	Unevaluated
P-23-001662 CA-MEN-1876 No USFS number	Pre-European contact	Lithic scatter with groundstone	Within FERC Project boundary	Unevaluated
P-23-001794 CA-MEN-2022 No USFS number	Pre-European contact	Village site with midden, lithics, groundstone, steatite, beads, and hopper mortar	Within FERC Project boundary	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	Location	NRHP Evaluation Status
P-23-006307 CA-MEN-3825H No USFS number	Historic-period	Concrete foundation, excavated pit, and wood pole	Within FERC Project boundary	Unevaluated
P-23-006308 CA-MEN-3826 No USFS number	Pre-European contact	Lithic scatter	Within FERC Project boundary	Unevaluated
P-23-006309 CA-MEN-3827 No USFS number	Pre-European contact	Three possible housepits	Within FERC Project boundary	Unevaluated
P-23-001468 CA-MEN-1581 No USFS number	Pre-European contact	Midden with lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-000431 CA-LAK-419 No USFS number	Pre-European contact	Midden and lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-000432 CA-LAK-420 No USFS number	Pre-European contact	Midden, housepit, lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001116 CA-LAK-1335 5085400300	Pre-European contact	Lithic scatter with groundstone	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001117 CA-LAK-1336 No USFS number	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001118 CA-LAK-1337 05-08-54-0311	Pre-European contact	Chert quarry and lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	Location	NRHP Evaluation Status
P-17-001119 CA-LAK-1338 05-08-54-0312	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001423 CA-LAK-1780 05-08-54-0581	Pre-European contact	Chert quarry	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001425 CA-LAK-1854 05-08-54-0123	Pre-European contact	Lithic scatter and possible chert quarry	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001797 CA-LAK-1674 05-08-54-0563	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-001880 CA-LAK-1771 05-08-54-0577	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002007 No trinomial 05-08-54-0124	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002155 CA-LAK-1993H 05-08-54-0646	Historic-period	Refuse deposit	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002241 CA-LAK-2017 05-08-54-0561	Pre-European contact	Lithic scatter and possible chert quarry	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002242 CA-LAK-2018 05-08-54-0562	Pre-European contact	Lithic scatter and possible chert quarry	Within 0.5-mile buffer of FERC Project boundary	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**Location**	**NRHP Evaluation Status**
P-17-002881 No trinomial No USFS number	Pre-European contact	Round house, housepits, midden, lithics, and groundstone	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002887 CA-LAK-2239H No USFS number	Historic-period	Structure pad and debris	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002973 CA-LAK-2281H No USFS number	Historic-period	Scott Dam Construction Camp - tent camp	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002974 CA-LAK-2282H No USFS number	Historic-period	Scott Dam Construction Camp - structure pads	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002979 CA-LAK-2287 No USFS number	Pre-European contact	Franciscan chert quarry and lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-002984 CA-LAK-2292H No USFS number	Historic-period	Historic-period refuse deposit	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-23-001469 CA-MEN-1582 No USFS number	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-23-001471 CA-MEN-1584 No USFS number	Pre-European contact	Lithic scatter	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-23-002247 CA-MEN-2547 No USFS number	Pre-European contact	Pomo village site with extensive assemblage	Within 0.5-mile buffer of FERC Project boundary	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**Location**	**NRHP Evaluation Status**
P-23-002977 CA-MEN-1093 No USFS number	Pre-European contact	Midden with burials	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-23-006306 CA-MEN-3824H No USFS number	Historic-period	Historic concrete foundation with hearth, refuse scatter, and possible privy	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
P-17-000960 No trinomial 05-08-54-0179	Pre-European contact	Cobble collection and reduction area	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
4-Lak-S265 No primary number No trinomial No USFS number	Pre-European contact	Midden site with one housepit and possibly a second	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
4-Men-S586 No primary number No trinomial No USFS number	Pre-European contact	Dark midden	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
4-Men-S591 No primary number No trinomial No USFS number	Pre-European contact	Flat bench with housepits and rock outcroppings	Within 0.5-mile buffer of FERC Project boundary	Unevaluated
MEN-ISO-07 No primary number No trinomial No USFS number	Pre-European contact	Modified flake tool isolate	Within 0.5-mile buffer of FERC Project boundary	Unevaluated

Key: USFS – U.S. Forest Service

Built Environment

Of the previously recorded resources, ten are built-environment resources; two of these have been determined not eligible for listing in the NRHP (P-17-002490 Scott Dam and P-23-004695 Potter Valley Powerhouse & Penstocks), one is recommended as not eligible (P-23-005838 Potter Valley Penstock), and six have not been previously evaluated. One resource, Cape Horn Dam (P-23-001998) requires revaluation due to the time that has elapsed since the previous evaluation and subsequent modifications to the dam.

Archaeological Resources

Sixty previously recorded archaeological resources were identified by the CCRD records search and information sources review, of which 40 are pre-European contact resources, 14 are historic-period resources, and 6 are multi-component resources. None of these previously recorded resources have been evaluated for listing in the NRHP.

Eel River Study Area

The CCRD records search and information sources review identified 159 previously recorded resources within the Eel River SA, the locations of which are shown in Maps 3.3.11-5a–y. They are listed in Tables 3.3.11-3 and 3.3.11-4 below.

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of sensitive cultural resources and qualify as Confidential Information (36 Code of Federal Regulations [CFR] Section 800.11[c][1]).[6] Disclosure of such information could result in damages to archaeological and other heritage resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.11-5a–y. CONFIDENTIAL Previously Recorded Resources Eel River Study Area.

The maps identified above are included in Volume IV, Exhibit E Privileged Information—Cultural Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

[6] The legal authority to restrict cultural resources information is in Section 304 of the National Historic Preservation Act of 1966, as amended. Furthermore, California Government Section Code 6254.10 exempts archaeological sites from the California Public Records Act, which requires that public records be open to public inspection.

This Page Intentionally Left Blank

Table 3.3.11-3. Previously recorded built-environment resources in the Eel River Study Area.

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-12-001315 CA-HUM-1040H No USFS number	Historic-period built-environment	Van Duzen River Bridge Caltrans Bridge No. 04-017L	Not eligible
P-12-000717 CA-HUM-726 No USFS number	Historic-period built-environment	Northwest Pacific Railroad (Humboldt portion)	Unevaluated
P-12-000918 No trinomial No USFS number	Historic-period built-environment	Scotia Bridge 27 Railroad Grade; THP #1-020-002 HUM (Bridge 27)	Unevaluated
P-12-000927 CA-HUM-1146H No USFS number	Historic-period built-environment	Monument Creek Railroad Grade	Unevaluated
P-12-003233 No trinomial No USFS number	Historic-period built-environment	State Route 254; Avenue of the Giants	Unevaluated
P-12-003312 CA-HUM-1589H No USFS number	Historic-period built-environment	Old Redwood Highway	Unevaluated
P-12-001218 No trinomial No USFS number	Historic-period built-environment	Mitchell House, two-story farmhouse	Unevaluated
P-12-001432 No trinomial No USFS number	Historic-period built-environment	Historic-period cemetery	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-12-001219 No trinomial No USFS number	Historic-period built-environment	Dwelley House	Recommended eligible
P-12-002559 No trinomial No USFS number	Historic-period built-environment	Fernbridge Tractor and Equipment Co. industrial/commercial building	Unevaluated
P-12-002927 No trinomial No USFS number	Historic-period built-environment	Bridge 04-0076; George Leatherwood Memorial Bridge	Not eligible
P-12-003799 No trinomial No USFS number	Historic-period built-environment	Bridge 04-0014; Eel River Bridge and Overhead	Not eligible
P-23-004190 No trinomial No USFS number	Historic-period built-environment	Bridge 10C-0005; Dos Rios Bridge	Not eligible
P-23-006257 No trinomial No USFS number	Historic-period built-environment	Hartstone Bible Camp	Recommended not eligible
P-12-001354 CA-HUM-1206H No USFS number	Historic-period built-environment	Twin/Dinner/Killer Creek Railroad	Unevaluated
P-12-002086 CA-HUM-1330H No USFS number	Historic-period built-environment	Blue Label railroad grade	Unevaluated
P-12-002087 CA-HUM-1331H No USFS number	Historic-period built-environment	Pacific Lumber Company railroad grade; Old Jordan Creek Camp - Bear Creek Spur	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-12-002126 No trinomial No USFS number	Historic-period built-environment	Nanning Creek railroad grade	Unevaluated
P-12-002127 No trinomial No USFS number	Historic-period built-environment	Railroad grade	Unevaluated
P-12-003170 CA-HUM-1499H No USFS number	Historic-period built-environment	HU-030; Overland Mail Route, old abandoned road	Unevaluated
P-23-002803 CA-MEN-2686H No USFS number	Historic-period built-environment	Mendocino Stagecoach grade	Unevaluated
P-12-002119 No trinomial No USFS number	Historic-period built-environment	Log cabin	Unevaluated
P-12-002593 No trinomial No USFS number	Historic-period built-environment	“Corduroy road” used for logging	Unevaluated
P-12-003861 No trinomial No USFS number	Historic-period built-environment	Fernbridge Rifle Range	Unevaluated
P-12-003908 No trinomial No USFS number	Historic-period built-environment	Shady railroad trestle	Unevaluated
RD02-1 No primary number No trinomial No USFS number	Historic-period built-environment	Road grade and fence	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
RD02-2 No primary number No trinomial No USFS number	Historic-period built-environment	Road cut and steel tank	Unevaluated
RD02-4 No primary number No trinomial No USFS number	Historic-period built-environment	Raised roadbed or railroad grade	Unevaluated
FL41-3 No primary number No trinomial No USFS number	Historic-period built-environment	Old historic road	Unevaluated
P-12-000929 No trinomial No USFS number	Historic-period built-environment	Fortuna Ranger Unit Headquarters	Recommended eligible
P-12-001546 No trinomial No USFS number	Historic-period built-environment	1711 Market Street Jacob House	Not eligible
P-12-001547 No trinomial No USFS number	Historic-period built-environment	1940 Market Street Mattews House	Not eligible
P-12-001548 No trinomial No USFS number	Historic-period built-environment	1911 Market Street Parks Property	Not eligible
P-12-001549 No trinomial No USFS number	Historic-period built-environment	Starch Factory and Humboldt Creamery site	Not eligible

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-12-001550 No trinomial No USFS number	Historic-period built-environment	Ambrosini Property	Not eligible
P-12-001551 No trinomial No USFS number	Historic-period built-environment	Heinichen Property	Not eligible
P-12-001552 No trinomial No USFS number	Historic-period built-environment	Richardson Property	Not eligible
P-12-001553 No trinomial No USFS number	Historic-period built-environment	Clausen Home	Not eligible
P-12-002377 No trinomial No USFS number	Historic-period built-environment	Silva-Vevoda Ranch	Unevaluated
P-12-002412 No trinomial No USFS number	Historic-period built-environment	Humboldt County Fairgrounds	Recommended eligible
P-12-002539 No trinomial No USFS number	Historic-period built-environment	1014 Port Kenyon Rd.	Unevaluated
P-12-002540 No trinomial No USFS number	Historic-period built-environment	1409 Main St	Unevaluated
P-12-002541 No trinomial No USFS number	Historic-period built-environment	1391 Main St	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-12-002542 No trinomial No USFS number	Historic-period built-environment	1373 Main St	Unevaluated
P-12-002543 No trinomial No USFS number	Historic-period built-environment	1353 Main St	Unevaluated
P-12-002544 No trinomial No USFS number	Historic-period built-environment	1345 Main St	Unevaluated
P-12-002545 No trinomial No USFS number	Historic-period built-environment	1331 Main St	Unevaluated
P-12-002546 No trinomial No USFS number	Historic-period built-environment	1319 Main St	Unevaluated
P-12-002547 No trinomial No USFS number	Historic-period built-environment	1311 Main St	Unevaluated
P-12-002548 No trinomial No USFS number	Historic-period built-environment	Wood Sidewalk, 1299-1345 Main Street	Not eligible
P-12-002555 No trinomial No USFS number	Historic-period built-environment	Alford Nielson House	Listed on the NRHP Date listed: 1/23/1986
P-12-002556 No trinomial No USFS number	Historic-period built-environment	1088 Port Kenyon Rd.	Recommended eligible

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-12-002928 No trinomial No USFS number	Historic-period built-environment	Scalvini Ranch	Recommended eligible
P-12-002929 No trinomial No USFS number	Historic-period built-environment	Sousa-Vevoda Ranch	Recommended eligible
P-12-002930 No trinomial No USFS number	Historic-period built-environment	Fuller Hamblin House	Unevaluated
P-12-002931 No trinomial No USFS number	Historic-period built-environment	Christiansen-Martin Ranch	Recommended eligible
P-12-002932 No trinomial No USFS number	Historic-period built-environment	Riverside Ranch	Unevaluated
P-12-002933 No trinomial No USFS number	Historic-period built-environment	Hamblin Farm equipment and blacksmith shop at Arlynda Corners	Unevaluated
P-12-002934 No trinomial No USFS number	Historic-period built-environment	Salladay-Bugbee Property	Unevaluated
P-12-002939 CA-HUM-1438H	Historic-period built-environment	Riverside Ranch dike and drainage system	Unevaluated
P-12-002941 No trinomial No USFS number	Historic-period built-environment	Channel improvement features	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-12-003141 No trinomial No USFS number	Historic-period built-environment	Ferndale Union Highschool	Recommended eligible
P-12-003144 No trinomial No USFS number	Historic-period built-environment	Golden State Company Building	Unevaluated
P-12-003262 No trinomial No USFS number	Historic-period built-environment	Meridian Road tide gate	Unevaluated
P-12-003301 No trinomial No USFS number	Historic-period built-environment	East Littlefield Historic Buildings	Unevaluated
P-12-003573 No trinomial No USFS number	Historic-period built-environment	Connick Ranch – Scotia Gun Club Cabin/ditches and levees	Recommended not eligible
P-12-003731 No trinomial No USFS number	Historic-period built-environment	Fern Cottage Historic District	Listed on the NRHP Date listed: 1/7/1988
P-12-003920 No trinomial No USFS number	Historic-period built-environment	Utterly Blessed Milk Cave	Unevaluated

Key: USFS – U.S. Forest Service

Table 3.3.11-4. Previously recorded archaeological resources in the Eel River Study Area.

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-17-000426 CA-LAK-414 No USFS number	Pre-European contact	Midden and lithic scatter	Unevaluated
P-17-000428 CA-LAK-416 No USFS number	Pre-European contact/historic-period	Midden with lithic scatter and collapsed historic-period structure	Unevaluated
P-17-000429 No trinomial No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-17-000430 No trinomial No USFS number	Pre-European contact	Midden and lithic scatter	Unevaluated
P-17-001010 CA-LAK-1183/H 05-08-54-0252	Pre-European contact/historic-period	Lithic scatter, square nail, and barbed wire	Unevaluated
P-17-001101 CA-LAK-1320 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-17-001102 CA-LAK-1321 No USFS number	Pre-European contact	Lithic scatter, hammerstones, possible groundstone and midden	Unevaluated
P-17-001103 CA-LAK-1322 No USFS number	Pre-European contact	Lithic scatter	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-17-001291 CA-LAK-1548 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-17-001428 CA-LAK-1857 No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated
P-17-002977 CA-LAK-2285H No USFS number	Historic-period	PG&E cabin foundation	Unevaluated
Fuller Grove Campground Isolates No primary number No trinomial No USFS number	Pre-European contact	Isolates mapped with no documentation or description	Unevaluated
P-23-001655 CA-MEN-1824 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-002984 CA-MEN-1124 No USFS number	Pre-European contact	"Antenna Flat Site"	Unevaluated
P-12-002079 No trinomial No USFS number	Historic-period	Remnants of Dobbyns Ferry including 6 wood pilings in Eel River	Unevaluated
4-Lak-S261 No primary number No trinomial No USFS number	Pre-European contact/historic-period	Midden deposit with "evidence of fallen down historic structure"; obsidian and silicate flakes	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
Logan Spring No primary number No trinomial No USFS number	Historic-period	Two spring boxes	Unevaluated
P-12-000050 CA-HUM-983 No USFS number	Pre-European contact	Two petroglyphs on a boulder	Unevaluated
P-12-000332 CA-HUM-319 No USFS number	Pre-European contact	Chert lithic scatter	Unevaluated
P-12-001029 CA-HUM-139 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-12-001956 No trinomial No USFS number	Historic-period	Water trough	Unevaluated
P-12-002063 No trinomial No USFS number	Pre-European contact	Chert biface isolate	Unevaluated
P-12-002088 No trinomial No USFS number	Historic-period	Remains of Old Jordan Creek Camp water tower	Unevaluated
P-12-002564 CA-HUM-1124H No USFS number	Historic-period	Bridge foundations and road grade of “Evans-Old Highway 101 Crossing”	Unevaluated
P-12-003532 No trinomial No USFS number	Historic-period	Machinery; heavy equipment drum	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-12-003710 No trinomial No USFS number	Pre-European contact	Isolated medial fragment of a handstone with two utilized surfaces	Unevaluated
P-12-003826 CA-HUM-1727H No USFS number	Historic-period	Historic-period habitation refuse	Unevaluated
P-12-003827 No trinomial No USFS number	Historic-period	Dumped 1940s-era Oldsmobile	Unevaluated
P-12-003830 No trinomial No USFS number	Historic-period	Pre-1960 abandoned vehicle	Unevaluated
P-12-003930 CA-HUM-1760 No USFS number	Pre-European contact	"Summit THP Site 1"	Unevaluated
P-23-002553 CA-MEN-2917 No USFS number	Pre-European contact	Petroglyphs (cupules, lines, designs) on a boulder	Unevaluated
P-23-003966 No trinomial No USFS number	Pre-European contact	Isolated bowl mortar fragment	Unevaluated
P-23-003967 No trinomial No USFS number	Pre-European contact	Isolated Franciscan chert core	Unevaluated
P-23-005560 No trinomial No USFS number	Historic-period	Scattered homestead debris	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
RD-02 Isolate G No primary number No trinomial No USFS number	Historic-period	Two apple trees and a bay tree	Unevaluated
RD-02 Isolate H No primary number No trinomial No USFS number	Historic-period	One apple tree	Unevaluated
Dean Creek Site; Dean Creek THP 1 No primary number No trinomial No USFS number	Historic-period	Railroad pilings and tin cans	Unevaluated
FL41-9 No primary number No trinomial No USFS number	Historic-period	Historic structural debris and refuse	Unevaluated
P-12-001510 CA-HUM-1340H No USFS number	Historic-period	Portions of a rock structure foundation	Unevaluated
P-12-001828 No trinomial No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated
P-12-002062 No trinomial No USFS number	Historic-period	Refuse, former site of railroad cars used for storage	Unevaluated
P-12-002118 No trinomial No USFS number	Pre-European contact	Chert quarry	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-12-002454 CA-HUM-1233 No USFS number	Pre-European contact	Lithic scatter and habitation debris	Unevaluated
P-12-002311 No trinomial No USFS number	Historic-period	Historic-period habitation refuse	Unevaluated
P-23-000435 CA-MEN-437 No USFS number	Pre-European contact	Petroglyphs	Unevaluated
P-23-000469 CA-MEN-475 No USFS number	Pre-European contact	Petroglyphs	Unevaluated
P-23-000470 CA-MEN-476 No USFS number	Pre-European contact	Petroglyphs	Unevaluated
P-23-000509 CA-MEN-521 No USFS number	Pre-European contact	Midden with habitation debris and possible burials	Unevaluated
P-23-000736 CA-MEN-799 No USFS number	Pre-European contact	Housepits and midden with lithic scatter	Unevaluated
P-23-000737 CA-MEN-800 No USFS number	Pre-European contact	Midden deposit with lithics	Unevaluated
P-23-000738 CA-MEN-801 No USFS number	Pre-European contact	Housepit with midden deposit and lithics	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-23-000739 CA-MEN-802 No USFS number	Pre-European contact	Midden deposit and lithics	Unevaluated
P-23-000740 CA-MEN-803 No USFS number	Pre-European contact	Midden deposit and lithics	Unevaluated
P-23-000741 CA-MEN-804 No USFS number	Pre-European contact	Housepits and midden with lithic scatter	Unevaluated
P-23-000747 CA-MEN-810 No USFS number	Pre-European contact	Midden with lithics	Unevaluated
P-23-000748 CA-MEN-811 No USFS number	Pre-European contact	Housepits with midden, lithics, and groundstone	Unevaluated
P-23-000749 CA-MEN-812 No USFS number	Pre-European contact	Midden with lithics and groundstone	Unevaluated
P-23-000750 CA-MEN-813 No USFS number	Pre-European contact	Midden with lithics	Unevaluated
P-23-001037 CA-MEN-1115 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-001038 CA-MEN-1116 No USFS number	Pre-European contact	Lithic scatter and groundstone	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-23-001040 CA-MEN-1118 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-001041 CA-MEN-1119 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-002116 CA-MEN-2411/H No USFS number	Pre-European contact/historic-period	Lithic scatter and historic-period homestead with orchard and debris	Unevaluated
P-23-002319 CA-MEN-2621 No USFS number	Pre-European contact	10 housepits with midden and artifacts	Unevaluated
P-23-002376 CA-MEN-2685 No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated
P-23-002422 CA-MEN-2736 No USFS number	Pre-European contact	Four housepits with midden and lithics	Unevaluated
P-23-002827 CA-MEN-2684 No USFS number	Pre-European contact	Midden with lithic scatter and groundstone	Unevaluated
P-23-003071 CA-MEN-1813 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-003962 CA-MEN-3195 No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-23-003963 CA-MEN-3196 No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated
P-23-003964 CA-MEN-3197 No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated
P-23-003965 CA-MEN-3198 No USFS number	Pre-European contact	Lithic scatter with groundstone	Unevaluated
P-23-005566 CA-MEN-3660 No USFS number	Pre-European contact/historic-period	Midden with lithic scatter; historic-period refuse	Unevaluated
P-23-005678 No trinomial No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-005740 No trinomial No USFS number	Pre-European contact/historic-period	Lithic scatter with groundstone, beads, and ceramic	Unevaluated
P-23-002919 CA-MEN-516 No USFS number	Pre-European contact	Temporary camp site	Unevaluated
P-53-000001 CA-TRI-1 No USFS number	Pre-European contact	Petroglyphs, housepits, midden, artifacts	Unevaluated
P-53-002233 No trinomial No USFS number	Pre-European contact	Six housepits, petroglyph, and midden	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-23-000465 CA-MEN-471 No USFS number	Pre-European contact	Unknown; missing site record	Unevaluated
P-12-000162 CA-HUM-105 No USFS number	Pre-European contact	Midden	Unevaluated
P-12-000163 CA-HUM-106 No USFS number	Pre-European contact	Midden	Unevaluated
P-12-000170 CA-HUM-113 No USFS number	Unknown	Unknown	Unevaluated
P-12-000171 CA-HUM-114 No USFS number	Pre-European contact/historic-period	Shell midden and temporary fishing camp	Unevaluated
P-12-001027 CA-HUM-137 No USFS number	Pre-European contact	Midden with lithic scatter	Unevaluated
P-12-001028 CA-HUM-138 No USFS number	Pre-European contact	Midden with lithic scatter	Unevaluated
P-12-001030 CA-HUM-140 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-12-002940 No trinomial No USFS number	Historic-period	Archaeological remains of ranching complex	Unevaluated

Resource Identifier: **Primary Number** **Trinomial** **USFS Number**	**Resource Type**	**Resource Description**	**NRHP Evaluation Status**
P-12-002942 No trinomial No USFS number	Historic-period	Concrete foundation	Unevaluated
P-12-003452 No trinomial No USFS number	Historic-period	Ocean Ranch house features	Unevaluated
P-12-003641 No trinomial No USFS number	Historic-period	Isolated bottle	Unevaluated
P-12-003782 CA-HUM-1713H No USFS number	Historic-period	Corral and barn features	Unevaluated

Built Environment

Of the previously recorded resources, 68 are built-environment resources; of these, 2 are listed in the NRHP, 13 have been determined not eligible, 43 have not been previously evaluated for listing in the NRHP, and 10 are recommended eligible for listing in the NRHP.

Archaeological Resources

Ninety-one previously recorded archaeological resources were identified by the CCRD records search and information sources review, of which 60 are pre-European contact resources, 23 are historic-period resources, 7 are multi-component resources, and one is unspecified. None of these previously recorded resources have been evaluated for listing in the NRHP.

East Branch Russian River Study Area

The CCRD records search and information sources review identified 17 previously recorded resources within the East Branch Russian River SA, the locations of which are shown in Maps 3.3.11-6a–c. They are listed in Tables 3.3.11-5 and 3.3.11-6 below.

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of sensitive cultural resources and qualify as Confidential Information (36 Code of Federal Regulations [CFR] Section 800.11[c][1]).[7] Disclosure of such information could result in damages to archaeological and other heritage resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.11.6a-c. CONFIDENTIAL Previously Recorded Resources East Branch of the Russian River Study Area.

The maps identified above are included in Volume IV, Exhibit E Privileged Information—Cultural Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

[7] The legal authority to restrict cultural resources information is in Section 304 of the National Historic Preservation Act of 1966, as amended. Furthermore, California Government Section Code 6254.10 exempts archaeological sites from the California Public Records Act, which requires that public records be open to public inspection.

This Page Intentionally Left Blank

Table 3.3.11-5 Previously recorded built-environment resources within the East Branch Russian River Study Area.

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-23-003767 No trinomial No USFS number	Historic-period/built-environment	East Canal of Potter Valley Irrigation District	Recommended not eligible

Key: USFS – U.S. Forest Service

Table 3.3.11-6. Previously recorded archaeological resources within the East Branch Russian River Study Area.

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-23-001249 CA-MEN-1354 No USFS number	Pre-European contact	Petroglyphs; two boulders and cupules	Unevaluated
P-23-001653 CA-MEN-1822 No USFS number	Pre-European contact	Midden with lithic scatter and groundstone	Unevaluated
P-23-000412 CA-MEN-390 No USFS number	Pre-European contact	Mehwinny Creek Village site, housepits with large depression and midden	Unevaluated
P-23-000436 CA-MEN-439 No USFS number	Pre-European contact	Midden site with lithics, groundstone, animal bones, and shell	Recommended eligible
P-23-000437 CA-MEN-440 No USFS #	Pre-European contact	Midden site with extensive, deep subsurface deposit	Unevaluated
P-23-000534 CA-MEN-583 No USFS number	Pre-European contact	Midden	Unevaluated
P-23-000540 CA-MEN-589 No USFS number	Pre-European contact	Midden with lithic scatter	Unevaluated
P-23-002938 CA-MEN-548 No USFS number	Pre-European contact	Village site with midden, lithics, and groundstone	Unevaluated

Resource Identifier: Primary Number Trinomial USFS Number	Resource Type	Resource Description	NRHP Evaluation Status
P-23-002939 CA-MEN-549 No USFS number	Pre-European contact	Described as "village"	Unevaluated
P-23-002978 CA-MEN-1094 No USFS number	Pre-European contact	Midden	Unevaluated
P-23-002980 CA-MEN-1096 No USFS number	Pre-European contact	Midden	Unevaluated
P-23-002981 CA-MEN-1097 No USFS number	Pre-European contact	Midden with chert and deer bone	Unevaluated
P-23-003088 CA-MEN-1840 No USFS number	Pre-European contact	Midden with lithic scatter	Unevaluated
P-23-004337 CA-MEN-3340 No USFS number	Pre-European contact	Lithic scatter	Unevaluated
P-23-004338 CA-MEN-3341 No USFS number	Pre-European contact	Midden with lithic scatter and groundstone	Unevaluated
P-23-004469 CA-MEN-3368 No USFS number	Pre-European contact	Dense lithic scatter with groundstone	Unevaluated

Key: USFS – U.S. Forest Service

Built Environment

Only one previously recorded built-environment resource was identified in the CCRD records search and information sources review, P-23-003767 East Canal of Potter Valley Irrigation District, which was recommended as not eligible for listing in the NRHP.

Archaeological Resources

Sixteen previously recorded archaeological resources were identified by the CCRD records search and information sources, all of which are pre-European contact resources. One of these resources, P-23-000436, is recommended as eligible for listing in the NRHP.

3.3.11.6 References

Caltrans (California Department of Transportation). 2006. Statewide historic bridge inventory update.

Fredrickson, David A. 1994. Archaeological taxonomy in Central California reconsidered. In Toward a New Taxonomic Framework for Central California Archaeology: Essays by James A. Bennyhoff and David A. Fredrickson, assembled and edited by Richard E. Hughes, pp. 91–103. Contributions of the University of California Archaeological Research Facility No. 52. Berkeley.

Fredrickson, David A. 1974. Cultural diversity in early Central California: A view from the North Coast Ranges. Journal of California Anthropology 1(1):41–53.

Hildebrandt, William, Cindy Baker, Mary Maniery, Sarah Heffner, and Jerome King. 2018. A cultural resources overview of the Berryessa Snow Mountain National Monument. Far Western Anthropological Research Group, Inc. and PAR Environmental Services, Inc.

King, Jerome H., William R. Hildebrandt, and Sharon A. Waechter. 2016. Part I – overview: a Class I cultural resources overview and existing information inventory for the Northwest California Integrated Resource Management Plan. Bureau of Land Management Redding and Arcata Field Offices. Far Western Anthropological Research Group, Inc.

Office of Historic Preservation. 2024a. California Register of Historical Resources. Available at: https://ohp.parks.ca.gov/ListedResources/?view=county&criteria=1. Accessed June 2024.

Office of Historic Preservation. 2024b. Built Environment Resources Directory. Available at: https://ohp.parks.ca.gov/?page_id=30338. Accessed June 2024.

Office of Historic Preservation. 2024c. California Historical Landmarks. Available at: http://ohp.parks.ca.gov/ListedResources/?view=county&criteria=1. Accessed July 2024.

Office of Historic Preservation. 2024d. California Points of Historical Interest. Available at: https://ohp.parks.ca.gov/?page_id=21747. Accessed July 2024.

Office of Historic Preservation. 1988. Five views: an ethnic sites survey for California. California Department of Parks and Recreation, Sacramento, CA.

PG&E (Pacific Gas and Electric Company). 2019a. Preliminary archaeological inventory of the FERC boundary conducted by Browning Cultural Resources, Inc. Data on file at PG&E.

PG&E (Pacific Gas and Electric Company). 2019b. Preliminary built-environment inventory of the FERC boundary conducted by Cardno, Inc. Data on file at PG&E.

PG&E (Pacific Gas and Electric Company). 2017. Potter Valley Hydroelectric Project FERC Project No. 77 relicensing pre-application document. On file, PG&E.

This Page Intentionally Left Blank

APPENDIX 3.3.11-A

Previous Studies

This Page Intentionally Left Blank

Table 3.3.11-A-1. Previous studies within the FERC Project Boundary Cultural Resources Study Area.

Report Identifier	Author	Year	Title
MNF-25-2005	Barbara White	2005	Archaeological Survey Report Short Form; Westshore Addendum; Case No. MNF-25-2005
S-040976	Suzanne Bley-Lansom	2006	Evaluation of Eligibility to the National Register of Historic Places of Swallow Rock Organization Camp (P-17-002427 (FS# 05-08-54-647))
MNF-73-2006	Suzanne Bley-Lansom	2006	Short Form Archaeological Survey Report; Swallow Rock Organization Camp, Special Use Permit, Lot 1; ASR No. MSF-73-2006
S-033226	Alex DeGeorgey	2007	An Archaeological Survey Report for the Benmore Timber Harvesting Plan, Lake County, California
MNF-25-2007	Barbara White	2007	Archaeological Survey Report Short Form; Pillsbury Resort Improvements; Case No. MNF-25-2007
S-035398	Cindy L. Baker and Monica Nolte	2008	Cultural Resources Inventory and National Register of Historic Places Evaluation for the Potter Valley (FERC 77) Penstock and Powerhouse Bypass Project, Mendocino County, California
S-037799	Cindy L. Baker and Monica Nolte	2010	Cultural Resources Investigation for the Scott Dam Project, Lake County, California
Gregory and Seamark 2012	Gregory Seamark, Molly Semark	2012	Archaeological Survey Report of the Pacific Gas and Electric Company Lake Pillsbury Boat Ramp Project, Lake County, California
Bunse 2013	Meta Bunse	2013	Technical Report: Historical Resources Inventory and Evaluation, Pacific Gas & Electric Company Potter Valley Penstock, Mendocino County, California
S-044128	Alex DeGeorgey	2016	Cultural Resource Survey of the PG&E Lake Pillsbury Boad Ramp Project, Lake County, California
S-050481	Heath Browning and Melinda Button	2018	PG&E's FERC No. 77 Recreation Facilities Hazard Tree Removal Cultural Resources Inventory, Mendocino National Forest, Mendocino & Lake Counties, California

Report Identifier	Author	Year	Title
S-050482	Heath Browning and Melinda Button	2018	Pacific Gas and Electric Company's PV Scott Dam Replace Redial Gate Hoist Project (FERC No. 77) Cultural Resources Inventory, Lake County, California
Browning 2019	Heath Browning	2019	Pacific Gas and Electric Company's Land Conservation Commitment, Eel River Project, Cultural Resources Inventory; 8188381
Browning 2022	Heath Browning	2022	Potter Valley Scott Dam Spillway Repairs, Staging Site 1 Cultural Resources Survey

Table 3.3.11-A-2. Previous studies within the Eel River Study Area.

Report Identifier	Author	Year	Title
S-036012	Jeremy Drakeford	2005	An Archaeological Survey Report for the MESA SELECCION Timber Harvest Plan, Humboldt County, California
S-041739	Nick Angeloff and James Roscoe	2005	A Cultural Resources Investigation of the Belleview Creek Fish Passage-Culvert Replacement Alternatives Project, located in Humboldt [County], California
S-041820	Craig R. Newman	2005	An Archaeological Survey Report for the Slater THP, Humboldt County, California
S-041848	Jason C. Serna	2005	An Archaeological Survey Report for the Moe's Tavern Timber Harvesting Plan, Humboldt County, California THP 1-05-032 HUM
S-041915	Loren Camper	2005	An Archaeological Survey Report for the Carson Ranch 2 Timber Harvesting Plan, Humboldt County, California, THP #1-04-214 HUM
S-042015	Amanda Cannon and James Roscoe	2005	A Cultural Resources Investigation of the Ozarian Creek Restoration Project Located in Humboldt County, California
S-042025	Jeremy Draksford	2005	An Archaeological Survey Report for the Poison Oak Eel Timber Harvesting Plan, Humboldt County, California; THP #1-05-243 HUM
S-042039	Stephen Hohman	2005	An Archaeological Survey Report for the Tilt Timber Harvest Plan, Humboldt County, California; THP #1-05-144 HUM
S-042201	Brent Barriteau	2005	An Archaeological Survey Report for the Peaked Timber Harvesting Plan, Humboldt County, California
S-042383	Jason Serna	2005	An Archaeological Survey Report for the Green Machine Timber Harvest Plan, Humboldt County, California; THP #1-05-098 HUM
S-042385	A. J. Evanson	2005	An Archaeological Survey Report for the Full Boat Timber Harvest Plan, Humboldt County, California; THP #1-05-112 HUM
S-042386	Thomas Blair	2005	An Archaeological Survey Report for the LE KILER THP, Humboldt County, California; THP #1-05-248 HUM
S-042645	Mark Distefano	2005	An Archaeological Survey Report for the LE NANNING THP, Humboldt County, California; THP #1-05-242 HUM

Report Identifier	Author	Year	Title
S-042646	Ryan Ross	2005	An Archaeological Survey Report for the Howard Timber Harvesting Plan, Humboldt County, California; THP #1-05-142 HUM
S-042813	Mark Distefano	2005	An Archaeological Survey Report for the PITCHFORK THP, Humboldt County, California; THP #1-06-098 HUM
S-042875	William C. Rich	2005	A Cultural Resources Investigation of the South Kneeland Timber Harvest Plan, Humboldt County, California
S-044708	Paul Grunden	2005	An Archaeological Survey Report for the "Casa Blanca" Timber Harvesting Plan Humboldt County, California; THP 1-05-110HUM
S-045321	Chris Carroll	2005	An Archaeological Survey Report for the Carson Ranch 3 Timber Harvesting Plan, Humboldt County, California
S-042180	James Roscoe	2006	A Cultural Resource Investigation of Assessor Parcel Number 308-251-07, Located on Eel River Drive, Humboldt County, California
S-042291	Jeremy Drakeford	2006	An Archaeological Survey Report for the Big Kitty Timber Harvest Plan, Humboldt County, California; THP #1-06-108 HUM
S-042293	Stephen Hohman	2006	An Archaeological Survey Report for the Scrambled Byron Harvest Plan, Humboldt County, California; THP #1-06-158 HUM
S-042376	Benjamin Hawk	2006	An Archaeological Survey Report for the Plantation Thin THP, Humboldt County, California, THP #1-06-220 HUM
S-042378	Brent Barriteau	2006	An Archaeological Survey Report for the Puma Timber Harvesting Plan, Humboldt County, California, THP #1-06-094 HUM
S-042380	Stephen Hohman	2006	An Archaeological Survey Report for the Le Monument Timber Harvest Plan, Humboldt County, California; THP #1-05-255 HUM
S-042451	Chris Carroll	2006	An Archaeological Survey Report for the Carson Ranch 4 Timber Harvesting Plan, Humboldt County, California; THP #1-06-131 HUM
S-042488	Mark Distefano	2006	An Archaeological Survey Report for the Grunert's Cabin Timber Harvest Plan, Humboldt County, California; THP #1-06-162 HUM
S-042652	Pabin N. Rana	2006	An Archaeological Survey Report for the RIO DELL 06 Timber Harvesting Plan #06-0601, Humboldt County, California; THP #1-06-066 HUM

Report Identifier	Author	Year	Title
S-042699	Nathan McKnight	2006	An Archaeological Survey Report for the Shady Timber Harvesting Plan, Humboldt County, California; THP #1-06-210 HUM
S-042787	Darren Niles	2006	An Archaeological Survey Report for the Red Tail Timber Harvest Plan, Humboldt County, California; THP #1-06-029 HUM
S-042815	Nathan McKnight	2006	An Archaeological Survey Report for the Sam Adams Timber Harvesting Plan, Humboldt County, California; THP #1-06-126 HUM
S-043218	A.J. Evanson	2006	An Archaeological Survey Report for the General Timber Harvest Plan, Humboldt County, California; THP #1-07-001 HUM
S-047826	Kari Jones	2006	Cultural Resources Assessment of the Grizzly Bluff 3-D Project (PL 822-23), Humboldt County, California (letter report)
S-047829	Timothy Keefe	2006	Archaeological Survey Report for the Proposed Redcrest Sink Project on California State Highway 101 at Post Mile 41.5 in Humboldt County, California, 01-HUM-101, PM 41.5, EA 01-470210
S-033226	Alex DeGeorgey	2007	An Archaeological Survey Report for the Benmore Timber Harvesting Plan, Lake County, California
S-039747	John Holson	2007	Cultural Resources Survey for the Grizzly Bluff 3-D Project (PL 822-31), Humboldt County, California
S-040323	James Roscoe, Jerry Rohde, and Nick Angeloff	2007	A Cultural Resources Investigation of the Proposed Rio Dell Wastewater Reuse Project, located in Rio Dell and Scotia, Humboldt County, California
S-040560	Gerald T. Takan	2007	Scotia Historic Assessment Study
S-043029	Benjamin G. Hawk	2007	An Archaeological Survey Report for the LE Combo Timber Harvest Plan, Humboldt County, California; THP #1-07-106 HUM
S-043098	Craig R. Newman and Nick Angeloff	2007	An Archaeological Survey Report for the "More Shade" Timber Harvesting Plan, and an Archaeological Assessment of the More Shade THP Unit 2, Humboldt County, California; THP #1-07-070 HUM
S-043102	Brian Talbert	2007	An Archaeological Survey Report for the Frontage Timber Harvest Plan, Humboldt County, California; THP #1-07-107 HUM
S-043103	Nick Angeloff and Jerry Rohde	2007	Cultural Resource Inventory of Summit THP Unit 1

Report Identifier	Author	Year	Title
S-043269	Brent Vanderhorst	2007	An Archaeological Survey Report for the Shively Slivers Timber Harvesting Plan, Humboldt County, California; THP #1-07-086 HUM
S-043295	Stephen Hohman	2007	An Archaeological Survey Report for the LE 57 Timber Harvest Plan, Humboldt County, California; THP #1-07-161 HUM
S-043332	Jeff Smith	2007	An Archaeological Survey Report for the Gump Timber Harvesting Plan, Humboldt County, California; THP #1-07-080 HUM
S-043394	Todd Truesdell	2007	An Archaeological Survey Report for the Looped Timber Harvesting Plan, Humboldt County, California; THP #1-08-001 HUM
S-044668	Todd Truesdello	2007	An Archaeological Survey Report for the Notion Timber Harvesting Plan Humboldt County, California
S-044926	A.J. Evanson	2007	An Archaeological Survey Report for the LE 59 Timber Harvest Plan Humboldt County, California
S-043294	Ray Miller	2008	An Archaeological Survey Report for the Stafford Left Timber Harvesting Plan, Humboldt County, California; THP #1-08-047 HUM
S-043392	Karen Raskin and James Roscoe	2008	A Cultural Resources Investigation of the Eel River Arundo Eradication Project Located in Humboldt County, California, California Department of Fish and Game Project #R1-137
S-043562	Benjamin G. Hawk	2008	An Archaeological Survey Report for the LE 24 Timber Harvest Plan, Humboldt County, California
S-044731	Randall Wiese	2008	An Archaeological Survey Report for the Kahn - Howe Creek Timber Harvesting Plan Humboldt County, California
S-044927	Pabin N. Rana	2008	An Archaeological Survey Report for the RIO DELL 07 Timber Harvesting Plan #06-0701 Humboldt County, California
S-044964	Susan K. Stratton and Sandra Rosas	2008	FHWA080411A: State Route 101 Metal Beam Guardrail Project, Humboldt County, California; 01-HUM-101, K.P.O. 32-202.77 (P.M. 0.20-126.00)
S-045142	Dana E. Supernowicz	2008	Cultural Resources Study of the Ferndale Rooftop Project, T-Mobile USA Site No. SF-40883A, 989 Milton Avenue, Ferndale, Humboldt County, California 95536

Report Identifier	Author	Year	Title
S-045420	Mark Distefano	2008	An Archaeological Survey Report for Paine NTMP Humboldt County, California
S-047711	Milford Wayne Donaldson	2008	USN081204B; Demolition of Buildings at Naval Facility Centerville Beach, Humboldt County, California
S-047818	Kim Tremaine, Kim Kersey, Melissa Johnson, and David Goldsmith	2008	Cultural Resources Constraints Study for the Replacement of 24 Poles on the Bridgeville to Garberville 60k V Transmission Line, PG&E Order No. 30557750, Bridgeville to Garberville (23 poles)
S-036294	Jeff Haney	2009	Archaeological Survey Report for a Proposed Metal Beam Guardrail Repair/Upgrade Project along State Routes 1, 20, 128, 162, 1755, 253, & 271 in Mendocino County, California; 01-MEN-1, 20, 128, 162, 175, 253, 271, K.P./P.M. various, EA 01-464200
S-044622	Brian Talbert	2009	An Archaeological Survey Report for the Double Mint Timber Harvest Plan Humboldt County, California
S-044819	Stephen Hohman	2009	An Archaeological Survey Report for the Evans Non-Industrial Management Plan, Humboldt County, California
S-045120	Diane F. Bonner and Wayne H Bonner	2009	Cultural Resources Records Search and Site Visit Results for T-Mobile USA Candidate SF40882 (Drake Hill Rd.), Intersection of Drake Hill Road and Thelma Street, Fortuna, Humboldt County, California (letter report)
S-045423	Lorna Billat	2009	An Archaeological Assessment of Proposed CA Rural Service Area #1_Project: Ferndale / CA-568462 Wireless Telecommunications Service Facility Near Ferndale, Humboldt County, California
S-037799	Cindy L. Baker and Monica Nolte	2010	Cultural Resources Investigation for the Scott Dam Project, Lake County, California
S-041929	Matthew Steele and James Roscoe	2010	A Cultural Resources Investigation of the Arundo Donax Removal Project Located in Humboldt County, California, California Department of Fish and Game Project
S-043398	Dana E. Supernowicz	2010	Cultural Resources Study of the Ferndale Fairgrounds Project, US Cellular Site # CA-568462, 1250 5th Street, Ferndale, Humboldt County, CA 95536
S-044070	Joan Fine	2010	Finding of Effect For the Pavement Rehabilitation project On State Route 254 in Humboldt County (01-Hum-254, PM 12.70/20.60, EA 01-498400)

Report Identifier	Author	Year	Title
S-044114	Todd Golder and Katie Tenneson	2010	Field Office Report of Cultural Resources Ground Survey Findings 560 Access Road,578-stream crossing
S-044413	John W. Jones	2010	Cultural Resources Survey for the Wetlands Reserve Program: Belli Project Area, Humboldt County, California
S-044414	Jason A. Colman, Amy Dunay, and C. Jesse Phillips	2010	Cultural Resources Survey Report for the Vevoda Floodplain Easement Project, Humboldt County, California
S-044662	Deakon Duey	2010	An Archaeological Survey Report for the Above Elinor 10 Timber Harvesting Plan Humboldt County, California
S-044752	John P. Andersen	2010	An Archaeological Survey Report for the Casa Roja Timber Harvesting Plan Humboldt, California
S-047830	Jim Cassidy	2010	Archeological Resources Survey Report Fairview Housing Complex, Centerville Beach Facility, Naval Facilities Southwest, Humboldt County, California
S-037799	Cindy L. Baker and Monica Nolte	2010	Cultural Resources Investigation for the Scott Dam Project, Lake County, California
S-038865	Shelly Tiley and Shannon Tushingham	2011	Volume I: Report and Appendices A-E, Native American Ethnogeography, Traditional Resources, and Contemporary Communities and Concerns: Cultural Resource Inventory of Caltrans District 1, Rural Conventional Highways: Del Norte, Humboldt, Mendocino, and Lak
S-043826	James Roscoe and William Rich	2011	Addendum Report for Additional Phase I Cultural Resources Investigation of the Proposed Salt River Ecosystem Restoration Project Located near Ferndale, Humboldt County, California
S-043942	Gail St. John	2011	Historic Property Survey Report for a Proposed Overlay Project on State Route 211, Fernbridge, Humboldt County, California
S-045114	Robert McCann	2011	Field Office Report of Cultural Resources Ground Survey Findings: 578- Stream Crossing, 587- Culvert, 382-Fence, 327-Conservation Cover, 643- Restoration and Management of Rare and Declining Habitats
S-045116	Chris Carroll	2011	An Archaeological Survey Report for the Tompkins Hill THP, Humboldt County, California

Report Identifier	Author	Year	Title
S-045138	Pam Paullin	2011	Field Office Report of Cultural Resources Ground Survey Findings, Fencing, Wetland Enhancement Activities
S-045421	William S. Dann	2011	Confidential Archaeological Addendum for Timber Operations on Non-Federal Lands in California; An Archaeological Survey Report for the Satterlee "New 2011" Timber Harvesting Plan, Humboldt County, California
S-045424	James Roscoe, William Rich, and Jerry Rohde	2011	An Archaeological Survey Report for the Waddington Road/ Salt River Bridge Seismic Retrofit Project Located near Ferndale, Humboldt County, California
S-045426	Chris Carroll	2011	An Archaeological Survey Report for the Loleta THP Humboldt County, California
S-049216	Jason Ball	2011	An Archaeological Survey Report for the Jimmy Dean Timber Harvesting Plan, Humboldt County, California
No report number	Cardno ENTRIX	2011	Fortuna DPA Project, Cultural Resources Survey Report for the Eel River Substation Expansion Project
S-039842	Ray Miller	2012	An Archaeological Survey Report for the Pries Timber Harvesting Plan, Humboldt County, California
S-039895	Robert McCann	2012	Field Office Report of Cultural Resources Ground Survey Findings, 74910412769
S-039896	Robert McCann	2012	Field Office Report of Cultural Resources Ground Survey Findings, Fence, Pipeline, Access Road, Watering Facility, Prescribed Grazing, 7491041277W
S-039898	Robert McCann	2012	Field Office Report of Cultural Resources Ground Survey Findings, Fence, Access Road, Stream Crossing, Structure for Water Control (rock rip rap), 749104127CE
S-040350	Mark Distefano	2012	An Archaeological Survey Report for the Poison 13 THP, Humboldt County, California
S-040722	Ben C. Cohoon	2012	An Archaeological Survey Report for the Pharye-Talso Non-Industrial Timber Management Plan, Humboldt County, California
S-043813	R. Heath Browning	2012	Pacific Gas & Electric Company's Loleta, Cock Robin Island Road, Removal of Idle Facilities Project (PM: 30869368) - Cultural Resources Investigation, Humboldt County, California (letter report)
S-044145	Joshua B. Peabody	2012	Cultural Study, Cape Horn Dam Weir E3-A and 3B Replacement Project

Report Identifier	Author	Year	Title
S-044411	Erika Collins and Thomas Orr	2012	Archaeological Survey Report for the Fee to Trust Conveyance of APR 309-051-065, 309-051-068 and 309-071-025 Located in Humboldt County, California
S-044429	Joan Fine	2012	Historical Resources Evaluation Report for a Bridge Upgrade Project, State Route 254, Humboldt County, California
S-045118	James Roscoe, William Rich, and Jerry Rohde	2012	A Cultural Resources Investigation for the East Littlefield and Strongs Creek Plaza Wetland Mitigation Project Assessor's Parcel Numbers 202-121-006, 202-121-078, 202-121-083 Located in Fortuna, Humboldt County, California
S-045140	Jeff Haney	2012	Archaeological Survey Report for a Proposed Metal Beam Guardrail Project, along U.S. Highway 101, Humboldt County, California 01-HUM-101, K.P. 103.48-104.60/P.M. 64.30-65.00, EA 01-0B6800 E-FIS 0112000193
S-047317	William Rich and James Roscoe	2012	Cultural Resource Investigation for the Rohner Creek Flood Control Study, Results of Record Search, Located in Fortuna, Humboldt County, California
No report number	R. Heath Browning	2012	Pacific Gas and Electric Company’s Loleta, East Lake Slough, Down Guy and Anchor Replacement Project - Cultural Resources Investigation, Humboldt County, CA
30917763	Hallock, Ashley	2013	Cultural Resources Constraints Report- Rio Dell-1102 Blitz-Scotia Distribution Circuit Improvements (PM: 30917763)
Bunse 2013	Bunse, Meta	2013	Technical Report: Historical Resources Inventory and Evaluation, Pacific Gas & Electric Company Potter Valley Penstock, Mendocino County, California
S-040253	Jason A. Coleman	2013	Cultural Resources Survey Report for the Glenn & Gail Giaimo WRP Project, Humboldt County, California
S-040254	Jason A. Coleman	2013	Cultural Resources Survey Report for the Twiella Daugherty WRP Project, Humboldt County, California
S-040532	Melinda Salisbury and James Roscoe	2013	Addendum to the Greater Eel River Arundo Eradication Phase II Project (R1-57) (letter report)
S-042245	Jeff Haney	2013	Archaeological Survey Report for Proposed Installation of 17 Radio Repeater Stations in Humboldt, Lake, Mendocino, and Trinity Counties, California
S-043387	Ben C. Cohoon	2013	An Archaeological Survey Report for the FGF US Howe Creek 2013 THP County of Humboldt, California; THP 1-13-069 HUM

Report Identifier	Author	Year	Title
S-043806	Michael C. Lommori	2013	An Archaeological Survey Report for the Cab Timber Harvesting Plan, Humboldt County, California
S-045259	William Rich	2013	A Cultural Resources Investigation of Assessor’s Parcel Number 200-362-012 - Egan Property Fortuna, Humboldt County, California
S-050988	Anmarie Medin and Carol Roland-Nawi	2013	Proposal for Updating the Caltrans Historic Bridge Inventory (43-SAC-O)
S-043529	J. Charles Whatford	2014	Archaeological Survey Report of the Brushy Mountain Vegetation Management Program Project (RX North-080 MEU), Mendocino County, California
S-045022	Mark Distefano	2014	An Archaeological Survey Report for the Grunert Cabin Non Industrial Timber Management Plan, Humboldt County, California
S-045574	Ben C. Cohoon	2014	An Archaeological Survey Report for the Olesen & Hawkins Slater Creek NTMP County of Humboldt, California. 1-14NTMP-006 HUM
S-045730	Chris Carroll	2014	An Archaeological Survey Report for the Carson Ranch 5 Timber Harvesting Plan, Humboldt County, California
S-046172	Jeff Smith	2014	An Archaeological Survey Report for the Crazy Horse Timber Harvesting Plan, Humboldt County, California
S-046188	Mark Distefano	2014	An Archaeological Survey Report for the Slater Creek THP, Humboldt County, California, THP 1-14-128 HUM
S-046515	Nicole Martensen and Karen Raskin	2014	A Cultural Resources Investigation of the California Department of Fish and Wildlife, Lower Eel Riparian Planting Project (HR-188), Humboldt County, California
S-046519	Nicole Martensen, Karen Raskin, and James Roscoe	2014	A Cultural Resources Investigation of the California Department of Fish and Wildlife, Francis Creek Barrier Removal at Port Kenyon Road Project #R1-FP271, Humboldt County, California
S-046527	Karen Raskin and William Rich	2014	A Cultural Resources Investigation of the California Department of Fish and Wildlife Bridge Creek Railroad Crossing Fish Passage Project (FP-187) REVISED, Humboldt County, California
S-046653	Merritt Lindgren	2014	An Archaeological Survey Report of the Satterlee "Wildcat" Timber Harvesting Plan, Humboldt County, California 1-15-034-HUM

Report Identifier	Author	Year	Title
S-046715	Anmarie Medin and Carol Roland-Nawi	2014	FHWA_2014_821_001; Metal Beam Guardrail Repair/Replace Project, Humboldt County
S-047622	Merritt Lindgren	2014	An Archaeological Survey Report for the Satterlee "Wildcat" Timber Harvesting Plan, Humboldt County, California, 1-16-017-HUM
S-048292	James Roscoe, Suzie Van Kirk, and William Rich	2014	A Cultural Resources Investigation for the Connick Ranch, Eel River Estuary Restoration Project, Humboldt County, California
S-049677	Jason A. Coleman	2014	Cultural Resources Survey Report for the Pedrazzini WRP Project, Humboldt County, California
No report number	Wisely, Justin	2014	Cultural Resources Constraints Report; L-177A CTS, PM 30937475
No report number	Grant, Joanne	2014	Cultural Resources Constraints Report; Eel River Tap 60 kV (PM 30889109)
T-328-14 CRCR	Wisely, Justin	2014	2014 Hydrotest Segment T-328-14, Cultural Resources Constraints Report
S-046149	Jason A Coleman	2015	Cultural Resources Survey Report for the Hansen ACEP-WRE Project, Humboldt County, California
S-046568	Lisas Machado	2015	Archaeological Survey Report for the Dos Rios Slips Project on State Route 162, Mendocino County, California 01-Men-162 P.M. 13.91 and 22.67
S-047337	Jason A. Coleman	2015	Cultural Resources Survey Report for the Renner Ranch ACEP-WRE Project, Humboldt County, California
S-047994	Susie Van Kirk	2015	California Department of Forestry and Fire Protection Fortuna Headquarters
422219157_CC-060_Fortuna_CRCR	Fies, Robin	2015	Cultural Resources Constraints Report for CC-060, Fortuna (PM 42219157)
No report number	Foutch Porras, Amy	2015	WRO Port Kenyon Road Pole Relocation (Eel River 1102 Circuit), Cultural Resources Constraints Report, PM Number: 31094629
S-047763	Michael C. Lommori	2016	An Archaeological Survey Report for the Zin Timber Harvesting Plan, Humboldt County, California
S-047980	Milan Atwell and Benjamin Hawk	2016	An Archaeological Survey Report for the TreeFarm THP, Humboldt County, California, 1-16-057-HUM

Report Identifier	Author	Year	Title
S-048914	Jason Coleman	2016	Cultural Resources Survey Report for the Russ Ranch and Timber Company ACEP-WRE Project, Humboldt County, California
S-048915	Dimitra Zalarvis-Chase, Elizabeth Hodges, and Juli	2016	Phase I Cultural Resource Inventory Report for the Olson Commercial Cannabis Permit Application
No report number	Deveraux, Alison Bryson	2016	Cultural Resources Constraints Report; EEL RIVER 1103 – Ferndale Anchor Replacement; PM 31225611
NEIC_014341	King, J, W Hildebrandt, and S Waechter	2016	Part I – Overview: A Class I Cultural Resources Overview and Existing Information Inventory for the Northwest California Integrated Resource Management Plan, Bureau of Land Management, Redding and Arcata Field Offices
S-044663	Chris Carroll	2017	Confidential Archaeological Addendum for the Larabee Ranch Holdings II THP, Humboldt County, California
S-048960	Deakon Duey	2017	An Archaeological Survey Report for the Little Red Timber Harvesting Plan Humboldt County, California
S-049378	Nick Robinson	2017	An Archaeological Survey Report for the Slater Creek THP, Humboldt County, California
S-049430	Deakon Duey	2017	An Archaeological Survey Report for the Stafford Right THP, Humboldt County, California
S-049662	Justin Coffman	2017	Confidential Archaeological Addendum Benmore Timber Harvesting Plan Lake County, California
S-050104	Alex DeGeorgey	2017	Archaeological Survey Report, Eric Schultz Commercial Cannabis Cultivation Project, 505 Palmer Lane (APN 200-243-036 & 200-243-037), Fortuna, Humboldt County, CA
No report number	Deveraux, Alison Bryson	2017	Cultural Resources Constraints Report; EEL RIVER 1102 – Ferndale Anchor Replacement; PM 31253304
No report number	Hammerle, Esme	2017	Cultural Resources Constraints Report; Gas Main 7th Street, Fortuna, Humboldt County; PM 31210218
S-051072	Deakon Duey	2018	An Archaeological Survey Report for the Monument 18 Timber Harvesting Plan, Humboldt County, California

Report Identifier	Author	Year	Title
S-051109	Noah Coonen	2018	Confidential Archaeological Addendum, Plan Name: Redcrest 18, Humboldt County, CA
S-051113	Cameron Holmgren	2018	An Archaeological Survey Report for the Hunt Dairy Timber Harvest Plan, Humboldt County, California
S-051117	Brita Rustad	2018	An Archaeological Survey Report for the Scotia Bluffs THP, Humboldt County, California
S-050481	Browning, Heath, and Melinda Button	2018	PG&E's No. 77 Recreation Facilities Hazard Tree Removal, Cultural Resources Inventory, Mendocino National Forest, Mendocino & Lake Counties, California, R2018050800014
S-050482	Browning, Heath, and Melinda Button	2018	Pacific Gas and Electric Company's PV Scott Dam Replace Redial Gate Hoist, Project (FEC No. 77), Cultural Resources Inventory, Lake County, California, May 2018
No report number	Turner, Angie	2018	Cultural Resources Constraints Report, HPR 54 Tompkins Hill Road, Loleta, Humboldt County, 30959118
No report number	Brabyn Hunter, Jocelyn	2021	Cultural Resources Constraints Report: Eel River Tap 60kV Routine CT 2021 188332; 8101016
Browning 2022	Heath Browning	2022	Potter Valley Scott Dam Spillway Repairs, Staging Site 1 Cultural Resources Survey
S-055995	Unknown	2022	A Cultural Resources Investigation Report for Commercial Cannabis Cultivation at 445 Stafford Road (APN 205-231-029) Scotia, Humboldt County, California
Siskin 2023	Barb Siskin, M. Osterlye, S. Izzie, A. Scott	2023	Archaeological Resources Inventory for Pacific Gas and Electric Company: Fruitland; Garberville; Rio Dell; Janes Creek; Trinidad; Big Lagoon; and Orick Cultural Support Study California Department of Parks and Recreation, North Coast Redwoods District, Humboldt and Mendicino Counties, California
No report number	Tim Spillane	2023	ASR for R-1850 DFM-1311-01 MP 2.06 Grade 1 Leak Repair
No report number	David Funk	2023	CRML for R-1850 DFM-1311-01 MP 2.06 Grade 1 Leak Repair
No report number	Tim Spillane and SunMin Choi	2023	ASR for R-1850 Grade 1 Leak Loleta DFM 1311-01, Order No. 74051720

Report Identifier	Author	Year	Title
No report number	Kira Dowdakin and Cody Haisley	2023	CRCR for CZ Eel River 1102 12kV Routine Humboldt County Eel River LCP CDFW 2023 017767
No report number	Jarrett Lowery	2024	CFSR for Gas Main Hwy 101 & Palmer, Fortuna

Table 3.3.11-A-3. Previous studies within the East Branch Russian River Study Area.

Report Identifier	Author	Year	Title
S-030900	Rod Parsons	2005	FHWA 050620C Re: Determinations of Eligibility and Finding of Effect for the MEN-20 Roadway Rehabilitation Project, State Route 20, Mendocino County, California
S-035401	Melinda A. Peak and Neal Neuenschwander	2007	Determination of Eligibility and Effect for the Proposed Edge Wireless Site CA-371, Potter Valley Telecommunications Facility, Mendocino County, California
S-035398	Cindy L. Baker and Monica Nolte	2008	Cultural Resources Inventory and National Register of Historic Places Evaluation for the Potter Valley (FERC 77) Penstock and Powerhouse Bypass Project, Mendocino County, California
S-036294	Jeff Haney	2009	Archaeological Survey Report for a Proposed Metal Beam Guardrail Repair/Upgrade Project along State Routes 1, 20, 128, 162, 1755, 253, & 271 in Mendocino County, California; 01-MEN-1, 20, 128, 162, 175, 253, 271, K.P./P.M. various, EA 01-464200
S-037772	Robert McCann	2010	Field Office Report of Cultural Resources Ground Survey Findings, Pipeline, Lined Waterway, Land Smoothing, and Critical Area Planting, 749104104JG8
S-039936	Robert McCann	2012	Field Office Report of Cultural Resources Ground Survey Findings, Fence, 749104124G1
S-048195	Robert McCann	2013	Cultural Resources Investigation for the Scott Dam Project, Lake County, California
S-049958	Alex DeGeorgey	2014	Archaeological Survey Report for the East Side Potter Valley Road Project, Potter Valley, Mendocino County, California
S-048072	Thad M. Van Bueren	2016	Historic Properties Survey for the Michael Court Property in Potter Valley, California, 12100 Michael Court, Potter Valley, CA 95469 - Assessor's Parcel 175-030-10

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of sensitive cultural resources and qualify as Confidential Information (36 Code of Federal Regulations [CFR] Section 800.11[c][1]).[8] Disclosure of such information could result in damages to archaeological and other heritage resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.11-A-1a–d. CONFIDENTIAL Previous Studies (2005-2024) FERC Study Area.

The maps identified above are included in Volume IV, Exhibit E Privileged Information—Cultural Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

8 The legal authority to restrict cultural resources information is in Section 304 of the National Historic Preservation Act of 1966, as amended. Furthermore, California Government Section Code 6254.10 exempts archaeological sites from the California Public Records Act, which requires that public records be open to public inspection.

This Page Intentionally Left Blank

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of sensitive cultural resources and qualify as Confidential Information (36 Code of Federal Regulations [CFR] Section 800.11[c][1]).[9] Disclosure of such information could result in damages to archaeological and other heritage resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.11-A-2a–c. CONFIDENTIAL Previous Studies (2005-2024) East Branch of the Russian River Study Area.

The maps identified above are included in Volume IV, Exhibit E Privileged Information—Cultural Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

9 The legal authority to restrict cultural resources information is in Section 304 of the National Historic Preservation Act of 1966, as amended. Furthermore, California Government Section Code 6254.10 exempts archaeological sites from the California Public Records Act, which requires that public records be open to public inspection.

This Page Intentionally Left Blank

CONFIDENTIAL

The following maps are being withheld from public disclosure in accordance with applicable regulations. These maps contain details on the locations of sensitive cultural resources and qualify as Confidential Information (36 Code of Federal Regulations [CFR] Section 800.11[c][1]).[10] Disclosure of such information could result in damages to archaeological and other heritage resources. The following maps are not available in the FERC's Public Reference Room, on the FERC's electronic library, or on PG&E's relicensing website except as an indexed item. To further understand FERC's regulations regarding confidential filings, visit https://ferc.gov/guides/filing-guidelines.

Maps 3.3.11-A-3a–v. CONFIDENTIAL Previous Studies (2005-2024) Eel River Study Area.

The maps identified above are included in Volume IV, Exhibit E Privileged Information—Cultural Resources. These maps will not be distributed to the public but are being e-filed with FERC under the "Privileged" tab and labeled "Confidential – Not for Public Distribution." Maps containing Confidential Information may be requested by entities and organizations with jurisdiction over these resources. To request copies, please contact Tony Gigliotti, PG&E Senior Relicensing Project Manager—Power Generation, at (925) 357-7120 or tony.gigliotti@pge.com.

[10] The legal authority to restrict cultural resources information is in Section 304 of the National Historic Preservation Act of 1966, as amended. Furthermore, California Government Section Code 6254.10 exempts archaeological sites from the California Public Records Act, which requires that public records be open to public inspection.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Figures

List of Maps

List of Acronyms

APE	Area of Potential Effects
BIA	U.S. Bureau of Indian Affairs
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CPUC	California Public Utilities Commission
FERC	Federal Energy Regulatory Commission
GLO	General Land Office
Indians	Native California Indians
IRA	Indian Reorganization Act
ITA	Indian Trust Asset
mi.	mile(s)
MPA	Marine Protected Areas
NAHC	Native American Heritage Commission
NCIDC	Northern California Indian Development Council
NPS	National Park Service
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SA	study area
TCP	Traditional Cultural Property
Tribes	California Indian Tribes
UC	University of California

3.3.12 Tribal Resources

This section identifies California Indian Tribes (Tribes) known to have cultural ties or other interests in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project) as well as the Eel River and the East Branch Russian River downstream of Project facilities that may be affected by implementation of the Proposed Action. In addition, this section includes a brief ethnographic and ethnohistoric context for the Project Tribal resources study areas (SAs) as well as contemporary Tribal uses and practices to identify information about Tribes, Tribal lands, and Tribal resources that could be affected by the proposed Project. This includes Indian Trust Assets (ITAs) and traditional cultural properties (TCPs), which are defined in Section 3.3.12.9. The Federal Energy Regulatory Commission's (FERC's) content requirements for this section are specified in Title 18 of the Code of Federal Regulations (CFR) §5.6(d)(3)(xii).

3.3.12.1 Information Sources

Information presented in this section was collected from readily available information sources listed below. Any applicable information from PG&E's initial relicensing efforts is also reflected in this section. Archival research and Tribal interviews were not conducted for this effort.

- *A Cultural Resources Overview of the Berryessa Snow Mountain National Monument* (Hildebrandt et al. 2018);
- Bureau of Land Management (BLM) General Land Office (GLO) Land Patent Search online database (BLM n.d.);
- BLM's *Northwest California Integrated Resource Management Plan* (King et al. 2016);
- Information provided by BLM, Bakersfield Field Office archaeologists by email dated January 10, 2017;
- Mendocino County, General Services Agency – Parcel Data (Mendocino County 2016);
- Native American Heritage Commission (NAHC) Sacred Lands File search and Tribal contacts database (2024);
- PG&E's Confidential Cultural Resources Database;
- *Potter Valley Hydroelectric Project FERC Project No. 77 Relicensing Pre-Application Document* (PG&E 2017);
- *Potter Valley Tribe of Pomo Indians: A Cultural and Historical Overview* (DeGeorgey 2007);
- *The Ethnogeography of the Pomo and Neighboring Indians* (Barrett 1908);
- Tribal government websites;

- Tribal letters and comments received from Pinoleville Pomo Nation, Potter Valley Tribe, Round Valley Indian Tribes, and Wiyot Tribe after PG&E's submittal of the Initial Draft Surrender Application in December 2023 (Appendix 3.3.12-A); and
- U.S. Bureau of Indian Affairs (BIA) data (2017, 2024a, 2024b).

3.3.12.2 Project Location and Overview

The Project is located on the Eel River and the East Branch Russian River in Mendocino and Lake counties, California, in the traditional territories and homelands of the Northern Pomo, Yuki, Cahto, Eel River Wailaki, North Fork Wailaki, Lassik, Lolangkok Sinkyone, Nongatl, Mattole, and Wiyot (Kroeber 1933). The Project is approximately 15 miles (mi.) northeast of the city of Ukiah. An overview of the major Project facilities is shown on Map 3.3.12-1.

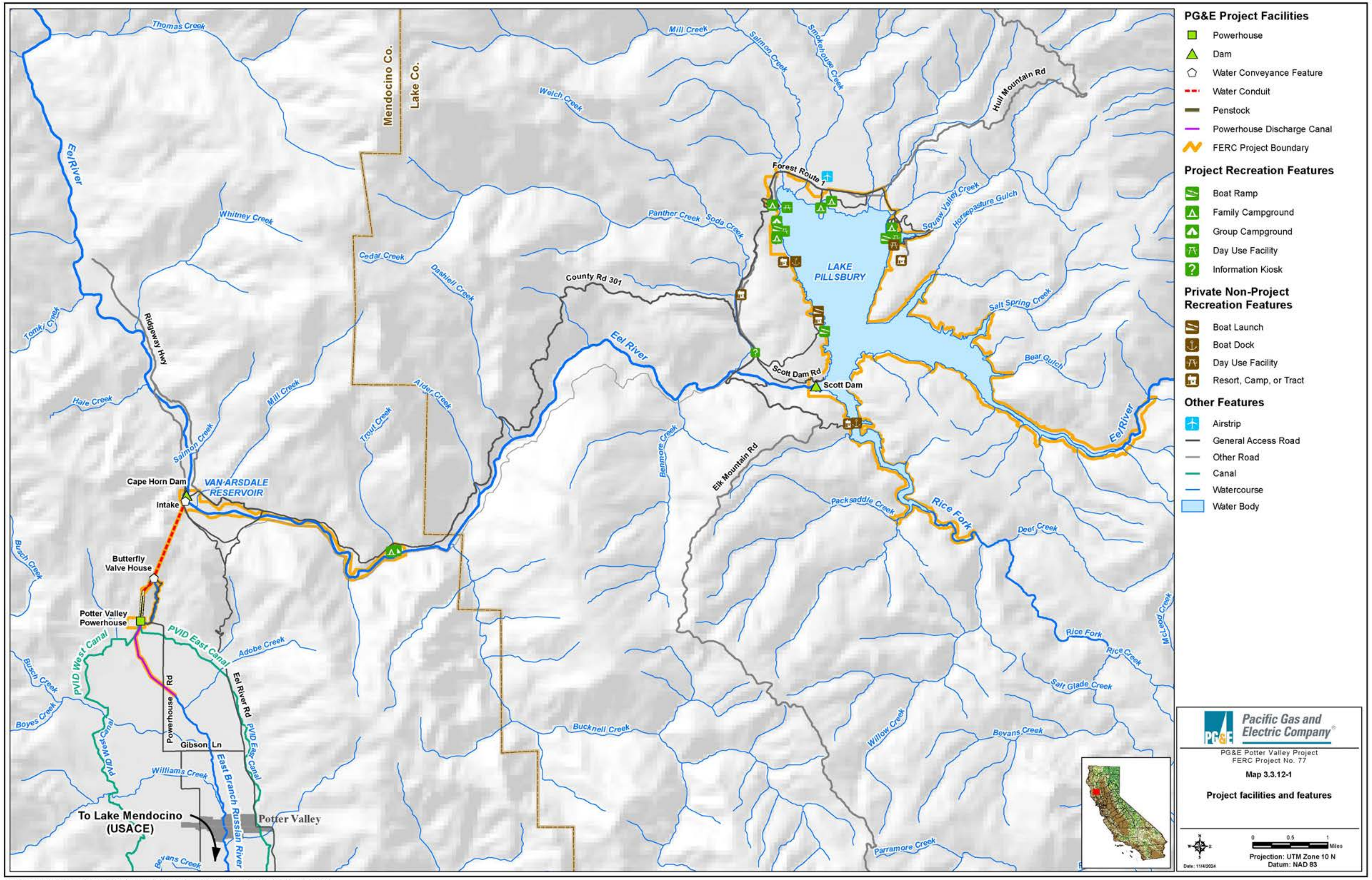
3.3.12.3 Tribal Resources Study Areas

Three Tribal SAs were developed to describe the cultural and Tribal context for Tribal resources and interests that may occur within the FERC Project boundary and the downstream reaches of the Eel and East Branch Russian rivers.

The following Tribal resources SAs were used to develop the information presented in this section (see Map 3.3.12-2):

- FERC Project Boundary Tribal SA: FERC Project boundary plus a 5-mi. buffer;
- Eel River Tribal SA: Eel River downstream of Scott Dam to the Pacific Ocean including the Eel River estuary (the SA ends at the Pacific Ocean at the estuary because any sediments from dam removal will be flushed and deposited in the river prior to reaching the estuary mouth); and
- East Branch of the Russian River Tribal SA: East Branch Russian River from Potter Valley Powerhouse tailrace to Lake Mendocino, plus a 1-mi. buffer on either side of the river.

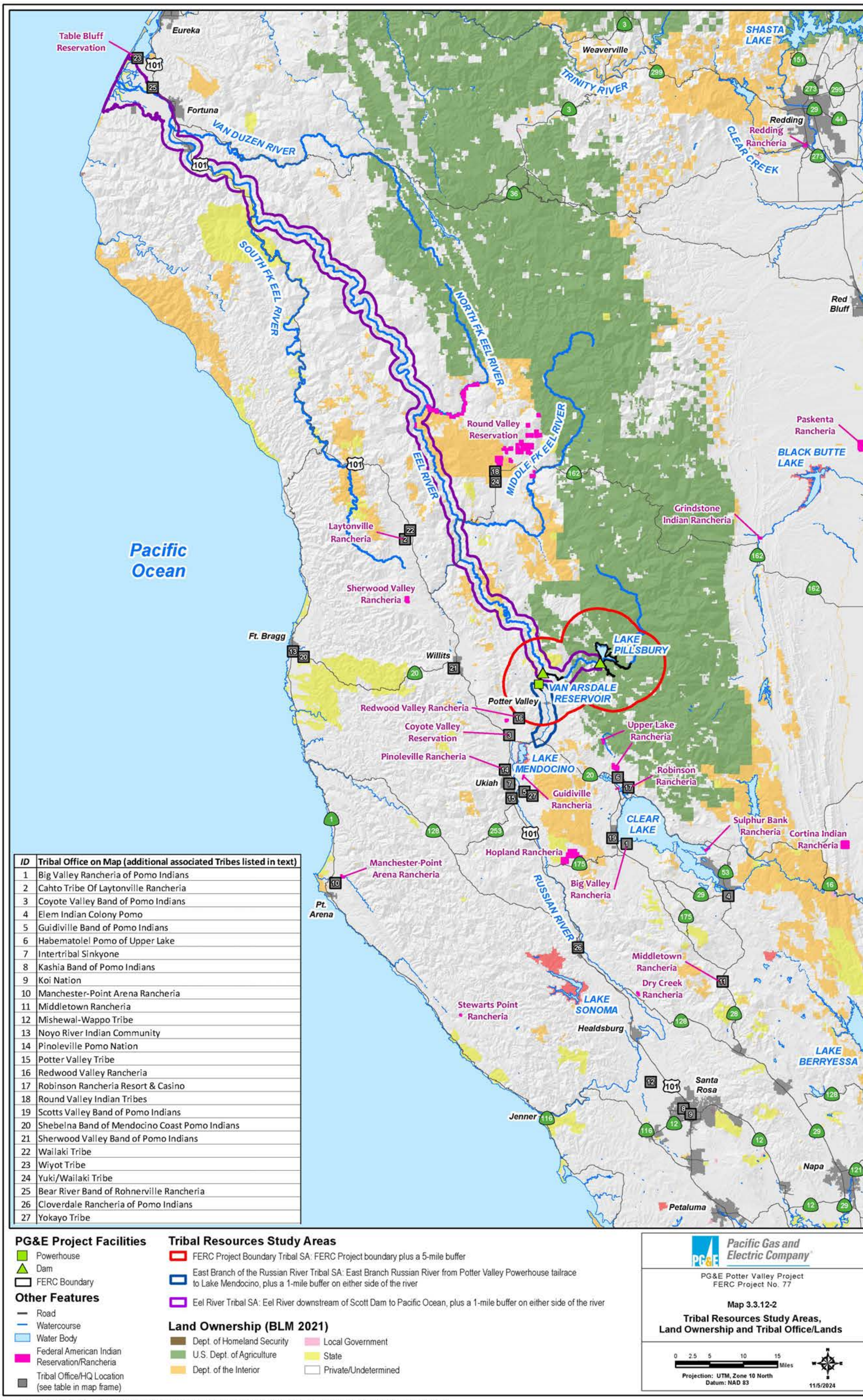
The FERC Project Boundary Tribal SA, where most of the potential direct and indirect effects from the Project may occur, includes a 5-mi. study buffer around the FERC Project Boundary to provide adequate context for understanding Tribal interests and resources. The SAs that include downstream reaches of the Eel and East Branch Russian rivers include a 1-mi. buffer on either side of the rivers to encompass any potential Tribal interests and resources that may be affected by downstream effects from decommissioning of the Project. An area of potential effects (APE) has not yet been defined. It will be developed in consultation with FERC, federal land management agencies, Tribes, stakeholders, and the State Historic Preservation Officer as part of compliance with Section 106 of the National Historic Preservation Act.



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\CulturalMaps\Map 3.3.12-1 ProjectFacilities&Features_11i17i_10.mxd

Map 3.3.12-1. **Project facilities and features.**

This Page Intentionally Left Blank



ID	Tribal Office on Map (additional associated Tribes listed in text)
1	Big Valley Rancheria of Pomo Indians
2	Cahto Tribe Of Laytonville Rancheria
3	Coyote Valley Band of Pomo Indians
4	Elem Indian Colony Pomo
5	Guidiville Band of Pomo Indians
6	Habematolel Pomo of Upper Lake
7	Intertribal Sinkyone
8	Kashia Band of Pomo Indians
9	Koi Nation
10	Manchester-Point Arena Rancheria
11	Middletown Rancheria
12	Mishewal-Wappo Tribe
13	Noyo River Indian Community
14	Pinoleville Pomo Nation
15	Potter Valley Tribe
16	Redwood Valley Rancheria
17	Robinson Rancheria Resort & Casino
18	Round Valley Indian Tribes
19	Scotts Valley Band of Pomo Indians
20	Shebelna Band of Mendocino Coast Pomo Indians
21	Sherwood Valley Band of Pomo Indians
22	Wailaki Tribe
23	Wiyot Tribe
24	Yuki/Wailaki Tribe
25	Bear River Band of Rohnerville Rancheria
26	Cloverdale Rancheria of Pomo Indians
27	Yokayo Tribe

Map 3.3.12-2. Tribal resources study areas, land ownership, and Tribal offices/lands.

This Page Intentionally Left Blank

3.3.12.4 Ethnographic and Ethnohistoric Context

The following ethnographic and ethnohistoric context was developed utilizing readily available information listed in Section 3.3.12.1. The following sections provide context for potential Tribal resources within the Tribal resources SAs as well as the Tribes and Tribal groups that may have an interest in the Project (see Section 3.3.12.6).

Previous Ethnographic and Linguistic Studies (late 1800s to present)

The following ethnographic context was developed utilizing information from early ethnographic and ethnolinguistic fieldwork conducted between the late 1800s and the early to mid-1900s with Native American consultants in the Project region. Much of this work was developed by the Department and Museum of Anthropology at the University of California (UC), Berkeley, whose founding in 1901 launched a wave of ethnographic work on Native peoples and cultures of California. Published works from that time referenced in this section include those by Barrett (1908), Kroeber (1925), and Loud (1918).

S.A. Barrett's 1908 ethnographic report was based on fieldwork conducted at the turn of the twentieth century. Through the UC Berkeley program mentioned above, Phoebe A. Hearst compiled and produced notes and maps from this research in 1903, 1904, and 1906. Barrett's fieldwork was primarily ethnolinguistic in nature and focused on mapping the territorial reach of various Pomo dialects, noting the relationships between dialects as well as with other neighboring native ethnolinguistic groups and plotting the locations of past village and camp sites. The neighboring groups investigated in relation to the Pomo included the Yuki, Athabascan, and Wintun. Alfred L. Kroeber was the supervisor of Barrett's fieldwork. Kroeber was also a source of information on Yuki ethnolinguistic groups, while P.E. Goddard provided information on Athabascan groups; both were professors at UC Berkeley at the time (Barrett 1908). Kroeber produced descriptions and maps of the ethnographic, linguistic, and cultural landscape of this region in the *Handbook of the Indians of California* (1925), *Native Tribes, Groups, Dialects, and Families of California in 1770* (1933), and *Cultural and Natural Areas of Native North America* (1939).

More recent studies include Helen McCarthy's ethnographies of the Mendocino National Forest (1982) and North Coast Range (1985), which overlap with the Project area and Tribal resources SAs. Alex DeGeorgey (2007) provides an in-depth cultural and historical overview of the Potter Valley region and the Pomo. BLM's *Northwest California Integrated Resource Management Plan* (King et al. 2016) offers a summary of early ethnographic research and an overview of Tribal groups within the Project vicinity including the Modoc, Shasta, Wintu, Nomlaki, Chimariko, Tolowa, Yurok, Wiyot, Karok, Hupa, Southern Athabascan groups, Yuki, Northern Pomo, Konkow, Achumawi, Atsugewi, and Yana. Additionally, Hildebrandt et al. (2018) provide a relevant synthesis and overview of cultural resources for portions of the FERC Project Boundary Tribal SA. Other ethnographic and ethnohistoric information in this section has been summarized from previous cultural resources studies and reports within the Tribal resources SAs, specifically works by Pappas (2018) and Peabody (2012).

Ethnographic Context from Early Ethnographic Studies

The Tribal resources SAs are known to have been inhabited by numerous California Indian ethnolinguistic groups, including (from south to north; see Map 3.3.13-3) the Northern Pomo, Yuki, Cahto, Eel River Wailaki, North Fork Wailaki, Lassik, Lolangkok Sinkyone, Nongatl, Mattole, and Wiyot (Kroeber 1933). The Wiyot fall within the Northwest Coast Culture Area, whereas the Pomo, Yuki, Cahto, Wailaki, Lassik, Sinkyone, Nongatl, and Mattole fit within the California Culture Area, as defined in Kroeber's (1939) culture areas. The California Culture Area groups subsisted on a wider array of food sources than the Northwest Coast Culture Area groups, which relied more on marine and riverine resources. Groups within the Northwest Coast Culture Area were more sedentary, establishing permanent settlements along coasts and rivers, and were organized around the family unit. In contrast, those in the California Culture Area tended to be more mobile, having seasonal settlements, and were organized in tribelets (King et al. 2016). The following sections provide an overview of each of these ethnolinguistic groups. Descendants of these groups who live or are associated with their traditional homelands in the Project area are discussed in Section 3.3.12.7.

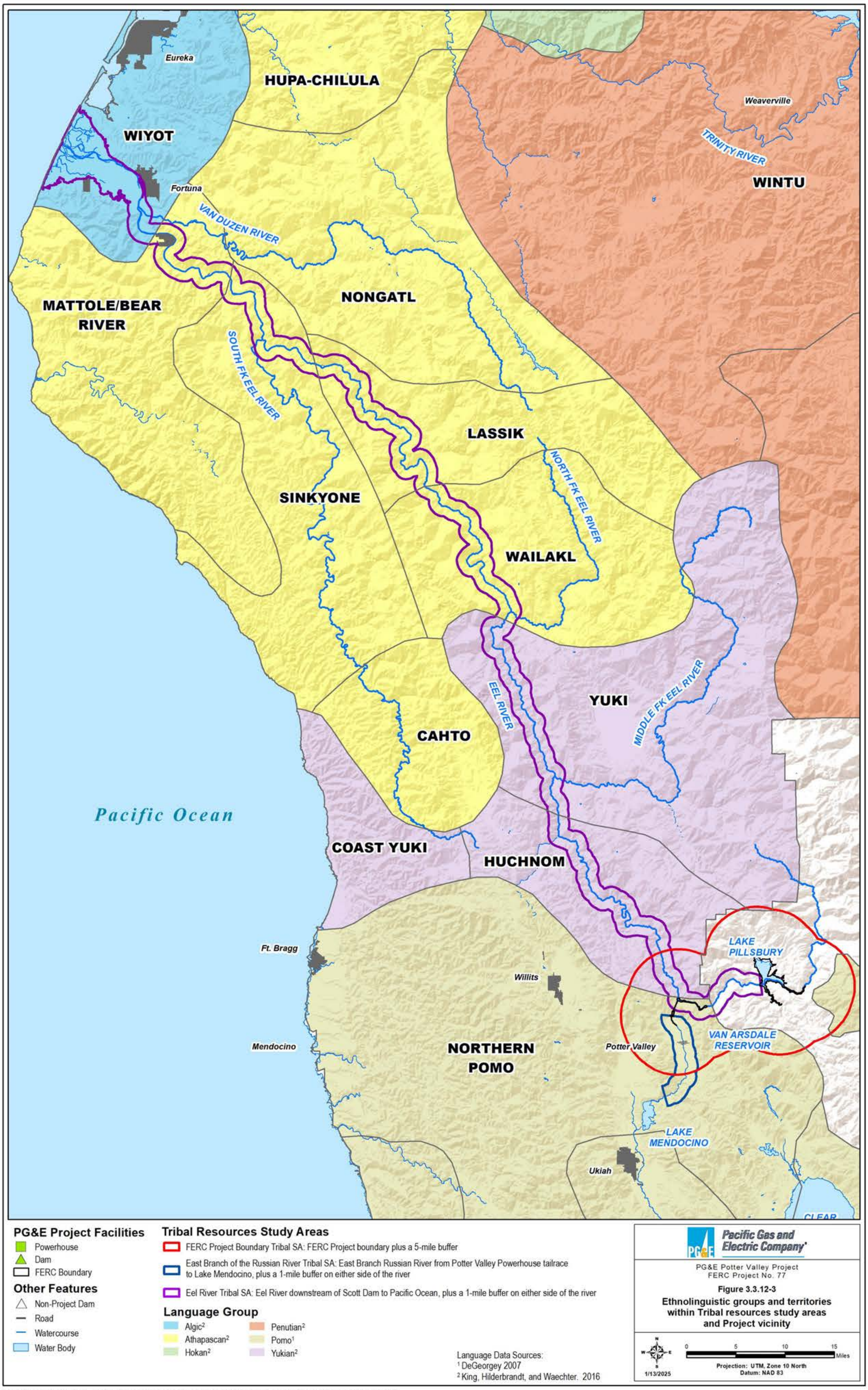
Pomo

Ethnogeography

There are seven recorded Pomo language families, consisting of unique dialects (Kroeber 1925). A portion of all the Tribal resources SAs falls within the territory of the Northern Pomo (see Map 3.3.12-3). The Northern Pomo held a wide-ranging territory in what is now Mendocino County, stretching 22 mi. along the coast and inland approximately 50 mi. to the northwest edge of Clear Lake (McLendon and Oswalt 1978). Most Northern Pomo tribelets occupied the valleys near the upper Russian River and upper Outlet Creek drainages, which extended north to the Eel River (Bean and Theodoratus 1978; Kroeber 1925).

Sociopolitical Organization

Pomo sociopolitical life was organized in tribelets or village communities, ranging in size from roughly 100 to 2,000 people and consisting of multiple "communal dwellings" (Kroeber 1925; Kunkel 1962; McLendon and Oswalt 1978:276). Tribelets generally had sociopolitical autonomy, with a chief or multiple chiefs presiding over each (Gifford 1926). Barrett (1908) stated that village leaders at the turn of the century were referred to as "captains" rather than chiefs, and they served mostly advisory roles. Kinship groups were organized bilaterally, and chieftain succession was often hereditary. Sometimes tribelets would band together for the purposes of controlling a large area of land or in response to warfare with neighboring groups (Kunkel 1962).



Map 3.3.12-3. Ethnolinguistic groups and territories within the Tribal resources study areas and Project vicinity.

This Page Intentionally Left Blank

Subsistence

The Northern Pomo primarily occupied freshwater riverine areas with a wide range of animal and plant food sources but would also travel seasonally to the coast and make temporary encampments to fish and collect other seafood (e.g., seaweed, kelp, clams) (Bean and Theodoratus 1978). Each tribelet had claim to a tract of land, but certain food sources (e.g., trees, fishing sites) could be privately owned by a family (Barrett 1908; McLendon and Oswalt 1978). Plant-based food sources included acorn and lily bulbs—both food staples—along with buckeyes, wild grapes, berries, seeds, lettuce, clover, potatoes, tarweed, mule ears, buttercups, wild oats, grasses, and anise (Bean and Theodoratus 1978). Over 46 different plant types were collected by the Pomo in the springtime alone (DeGeorgey 2007). In addition to serving as food sources, plants were also used by the Pomo for producing various tools, such as baskets, cords, ropes, and nets. The Pomo practiced careful plant management, and their "harvesting techniques helped propagate the plants, fostering new growth and increasing the overall health of plants" (DeGeorgey 2007:11).

Individual and communal hunting was common. Animal-based food sources included deer, elk, antelope, small game (e.g., squirrels, rabbits), and various birds. Tools included baskets, mortars, pestles, bow and arrows, clubs, spears, and traps, for which raw materials were often collected in the late summer and early fall (DeGeorgey 2007).

Intergroup Trade

Trade relations with the neighboring Yuki, Cahto, Lake Miwok, Wappo, and Patwin were significant (McCarthy 1982 and 1985 in Hildebrandt et al. 2018). The Northern Pomo were central to a trade network across what is now Northern California, serving as middlemen between Tribal groups. Traded goods ranged from "food (e.g., fish and salt), manufactured goods (e.g., beads), and raw materials (e.g., shells and obsidian)" (Bean and Theodoratus 1978; Peabody 2012:2–6).

Yuki

Ethnogeography

Yuki ethnolinguistic groups inhabited the region within the Northern Coast Range, including Round Valley (north of the Project) and the drainages of the middle and upper Eel River within the FERC Project Boundary and Eel River Tribal SAs (refer to Map 3.3.12-2 and Map 3.3.12-3 and Figure 3.3.12-1) (Foster 1944; Kroeber 1925; Miller 1978). The elevation of Yuki territory ranged from less than 1,000 to over 7,000 feet, approximately. Residences and villages were aligned with drainages of the Eel River and its tributaries (McCarthy 1982 and 1985 in Hildebrandt et al. 2018). The Yuki had six primary subdivisions, which were divided based on minor dialect variations. Four of these subdivisions were located near the Project, including the *Ukomno'm,* located in Round Valley, the *Witukomno'm* or *Uksismulhatno'm,* located in Eden Valley, the *Ta'no'm* located near the Wailaki, and the *Onkolukomno'm,* located in Gravelly Valley (Lake Pillsbury) and the nearby drainage of the Eel River (Foster 1944 in Hildebrandt et al. 2018). The other two subdivisions were the *Huititno'm*, located in the Black Butte River drainage, and the *Suksaltatamno'm*, located in the upper Middle Fork Eel River (Hildebrandt et al. 2018).

The area of the *Onkolukomno'm* is said to have been "a favorable location, but there are no survivors of the group and consequently little information on Rancherias in the vicinity" (Foster 1944:160 in Hildebrandt et al. 2018:89–91). Barrett (1908) reports that this area was also known as *nutc-ukom or niitc-iikom*, gravel-valley.

He reports that:

> *One informant, an old Yuki woman, born in Gravelly valley, gave nu'iikol as the name of the people formerly living in and about that valley, and it seems probable that this is a form of the word written by the whites 'Nome Cult' (the name of the government Indian farm established in Round valley in 1856, and later changed into a full reservation). The origin of the name is not known, but from the fact that nom, meaning west, occurs in Wintun, as no'mlaki, it is possible that the term came originally from that source.* (Barrett 1908:247)

Sociopolitical Organization

At the time of his fieldwork on the Yuki, Kroeber had not defined the term "tribelet" yet, so the number of Yuki tribelets is not as clear as in some other areas (e.g., Pomo). At that time, Kroeber used the term "political units." He estimated that the *Ta'no'm* had six political units, the *Ukomno'm* had three, the *Onkolukomno'm* likely had several, and the remaining subdivisions likely had one or two. Kroeber noted that "a dance house did not necessarily indicate a tribelet center for Yuki as it did in Pomo and Patwin territory" (Hildebrandt et al. 2018:89–91; Kroeber 1925, 1932). At the time of his fieldwork, Kroeber estimated the Yuki population to be roughly 2,000, but he noted that the number was likely conservative. This underestimation was confirmed by Cook, who estimated the population based on reported villages. Cook estimated the Yuki population to be 6,880 (Cook 1956; Hildebrandt et al. 2018; Kroeber 1925).

Subsistence

The Yuki maintained a seasonal migration pattern based on available food sources (King et al. 2016:104). Similar to the Hill Patwin and Nomlaki groups, the Yuki had "a gathering, hunting, and fishing economy" (Hildebrandt et al. 2018:92). The main difference for the Yuki/Huchnom was that they had access to plenty of salmon, so fishing was more readily available and significant to them than it was for their neighbors. The Yuki went on salmon runs three times per year, in the fall, winter, and spring. In the summer, the Yuki fished for trout, steelhead, and lamprey eel. The Yuki utilized gigging, netting, and weirs in their fishing practices. Fish processing included drying fish in the sun. Fishing was an important social practice. Families fished together on multi-day trips and shared their catch (Foster 1944 in Hildebrandt et al. 2018).

When occupying their winter village settlements, the Yuki subsisted on "acorns, pine nuts, hazelnut, peppernut, buckeye, and dried venison and fish," which had been acquired, processed, and stored leading up to the winter season (King et al. 2016:104). In the spring, they subsisted on available fresh foods (e.g., clovers, soaproot shoots, angelica roots). In late spring and into summer, winter villages were vacated, and seasonal camps were established as opportunities arose to collect and hunt more distant food sources (e.g., berries, seeds, deer, small game). In the fall, collecting, hunting, and fishing efforts, especially of acorn, pine nuts, deer, and salmon, increased in order to fill winter store houses

(Goddard and Holson 1993; King et al. 2016). Six or more kinds of acorns were collected (e.g., tan oak, valley oak, and black oak). Acorn processing included "a basket hopper and slab mortar" for grinding; the acorn meal was then boiled to make soup or baked into bread (Hildebrandt et al. 2018:93). To leaven the bread, a particular kind of red earth was added to the dough. Subsistence strategies were gendered, such that men typically were hunters and fishers, while women were gatherers, and everyone collected acorns (Miller 1978).

Intergroup Trade

Trade relations among the Yuki were primarily internal (e.g., with the Huchnom) but also extended to the neighboring Pomo. Exported trade items mainly consisted of food and furs in exchange for beads, shells, magnesite, dentalia shells, seafood, and salt (King et al. 2016; Kroeber 1925; Miller 1978).

Cahto

Ethnogeography

Some argue that the Cahto are the southernmost ethnolinguistic group in the Athabascan language family, which includes the Wailaki, Sinkyone, Nongatl, and Lassik (Baumhoff 1958; Kroeber 1925; Myers 1978). The Cahto inhabited multiple valleys up to the drainages of the South Fork Eel River, resting between Yuki territory to the east, west, and south and Sinkyone and Wailaki territories to the north within the FERC Project Boundary and Eel River Tribal SAs (see Map 3.3.12-3) (Kroeber 1925; Myers 1978).

Sociopolitical Organization

Prior to Euroamerican contact, there were approximately 50 Cahto villages, each of which had a village headman or chief and maintained permanent settlements (Kroeber 1925; Myers 1978). Headman succession was generally hereditary, with leadership being passed on to sons. Leadership power was also granted to the elders, to whom the chief served as advisor and deferred when disagreements arose (Myers 1978).

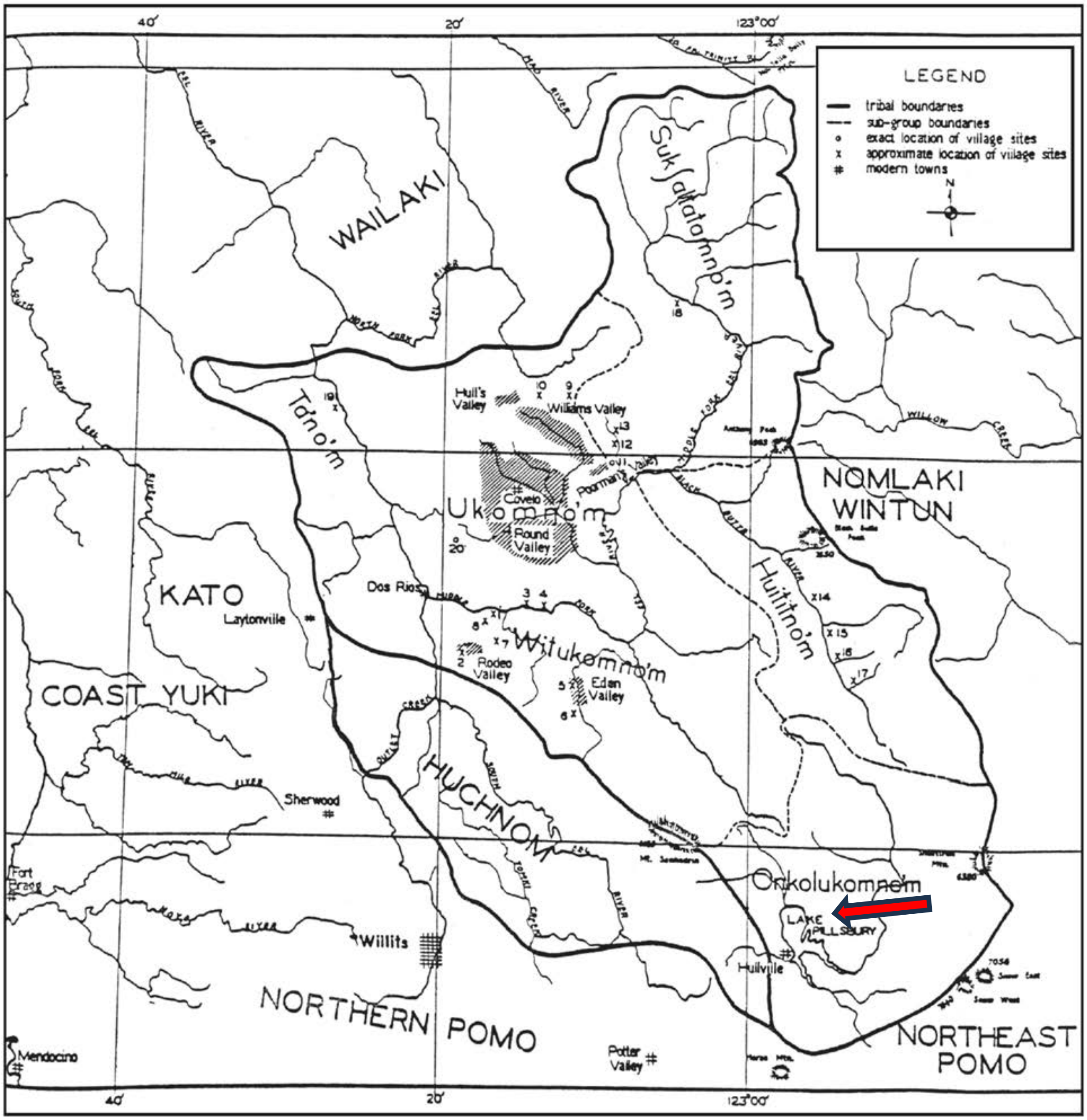


Figure 3.3.12-1 Yuki and Huchnom territories (Foster 1944); red arrow showing Lake Pillsbury.

Subsistence

Staple foods for the Cahto included acorns, tarweed seeds, and other plants, as well as deer, fish (especially salmon), black bears, cinnamon bears, and small game (e.g., minks, raccoons, moles, gophers, skunks, squirrels). A number of insects also served as food sources, including caterpillars, grasshoppers, bees, and hornets. Meat and fish were broiled or dried. Acorns were processed into bread and soups. Subsistence strategies were divided based on gender, with men typically hunting and fishing, while women gathered plant-based food sources. Everyone collected acorns. The Cahto were also known to travel west "to Coast Yuki territory…where they gathered shellfish and seaweed" (Myers 1978:244).

Intergroup Trade

The Cahto engaged in trade relations with various neighbors, including the Lassik, Coast Yuki, Wailaki, Northern Wintun, and other northern Tribal groups. They supplied hazelwood bows, clam disk beads, and clothing in exchange for salt, seafood, dentalia, and dogs (Myers 1978).

Wailaki, Lassik, Sinkyone, Mattole, and Nongatl

Ethnogeography

The Wailaki, Lassik, Sinkyone, Mattole, and Nongatl ethnolinguistic groups are part of the southern Athabascan language family within the Eel River Tribal SA. Each spoke different dialects of the same language, although the Mattole may have had their own separate language. The Wailaki and Lassik had bordering territories. The western border of both groups stretched along the South Fork Eel River, east of the Shelter Cove Sinkyone territory. The eastern border of Wailaki territory stretched along the North Fork Eel River down to Hull's and Casoose creeks. The southern border ran down to Big Bend Creek, bordering Yuki territory (Elsasser 1978a; Kroeber 1925). The northern border of Lassik territory met the southern border of Nongatl territory (Elsasser 1978a).

The Sinkyone had two subgroups: a southern group, Shelter Cove (not in the Tribal resources SAs), and a northern group, Lolangkok (within the Eel River Tribal SA), which got its meaning from Bull Creek (Elsasser 1978a; Kroeber 1925). Small portions of Mattole and Nongatl territories fall within the Eel River Tribal SA. Mattole territory stretched along the Pacific Coast from its northern border near Bear River and inland down the upper North Fork River, west of Lolangkok Sinkyone territory, to Spanish Flat. Nongatl territory ran east of the Eel River near present-day Scotia down to Blocksburg and east to a stretch along the upper Mad River (Elsasser 1978a). See Map 3.3.12-3.

Sociopolitical Organization

These five southern Athabascan ethnolinguistic groups were sociopolitically organized around tribelets, which typically had a main settlement near a drainage area (Elsasser 1978a; King et al. 2016). The Wailaki are known to have had a large number of tribelets, 19, and named villages, 95. The Lassik had three tribelets, consisting of approximately 20 named villages. The Lolangkok

Sinkyone subgroup consisted of two tribelets, with around 50 villages. It is estimated that the Mattole had two tribelets, which consisted of 60 villages. The Nongatl had six tribelets with around 35 villages.

Southern Athabascan tribelets were typically headed by a chief, most commonly male, who may have been elected based on accumulated wealth and/or patrilineal kinship. A nuclear family structure was prevalent among all five groups (Elsasser 1978a). Social stratification based on wealth was less prominent than in more northern groups (e.g., Yurok and Hupa) (Elsasser 1978a; King et al. 2016).

Subsistence

Similar to Yuki groups, the southern Athabascan groups occupied semi-permanent settlements during winter and had increased residential mobility in warmer seasons (King et al. 2016; Kroeber 1925). The environment of these southern Athabascan groups—which included the northern portions of the Northern Coast Range mountains, a majority of the Eel River drainage system, and portions of the northern coastline—provided edible seeds, acorns, buckeye, manzanita, pine nuts, various berries, and other plant-based foods (Elsasser 1978a). Particularly in springtime, clover, angelica roots, and tubers were collected (King et al. 2016). Terrestrial animals, such as deer and elk, were among the primary inland food sources (Elsasser 1978a; King et al. 2016). Maritime fishing along the coast occurred but was not as prevalent as among more northern groups (King et al. 2016). The main bodies of the Eel River and the Mattole River were key sources of fish (e.g., salmon, trout), and, in some cases, simple weirs were used (Elsasser 1978a; King et al. 2016).

Trade

Intergroup trade was not prevalent. King et al. theorize that this may be due to "lower priority placed on the development of wealth and large world-renewal ceremonies, both of which required significant quantities of exotic materials" (2016:103).

Wiyot

Ethnogeography

Humboldt Bay was the center of Wiyot territory, which encompassed redwood forest, the oceanfront, the bay, and lower river drainages (Elsasser 1978b). Wiyot territory is in the westernmost portion of the Eel River Tribal SA. The Bear River Mountain ridge acted as the Wiyot territory's southern border and separated the Wiyot from their southern Mattole neighbors. The northern border was marked by the Little River. The western border lay at the coastline, and the eastern border was shared with the neighboring Whilkut and Nongatl groups (Elsasser 1978b; Loud 1918). See Map 3.3.12-3.

Sociopolitical Organization

Unlike their southern neighbors and similar to other northern groups, the sociopolitical life of the Wiyot was not organized around formal Tribes or clans (Elsasser 1978b). The Wiyot lacked "tribal-wide political" leadership, such as chiefs (King et al. 2016:102). Instead, the household was the primary socioeconomic unit. Like other northwest California groups, the Wiyot lived in "semi-subterranean plank houses" in permanent villages (King et al. 2016:101). Women and children lived in square or rectangular family houses, whereas men occupied sweathouses. Kinship was patrilineal. Social stratification based on wealth was prevalent (Elsasser 1978b; King et al. 2016). Wealth items included obsidian blades, deer skins, dentalium shell money, and privately owned property containing key resources (King et al. 2016).

Subsistence

Although Wiyot territory consisted of a large portion of the coast, the Wiyot relied on food sources that could be acquired from the "still waters" of the bay and rivers and from prairies rather than the ocean (Elsasser 1978b:156). According to Loud (1918), the Wiyot stated they did not fish at the Little River; however, they likely did fish at the Eel and Mad rivers (Elsasser 1978b). The Wiyot collected plant-based foods, particularly wild potatoes, berries, and acorn (Loud 1918). Animal food sources were primarily fish, especially salmon, but also included deer, elk, small game, mollusks, and sea mammals, such as sea lions and beached whales (Elsasser 1978b). The Wiyot may have acquired acorns through trade with their southern Athabascan neighbors (Elsasser 1978b).

Ethnohistoric Context

The following discussion has been adapted from *Potter Valley Tribe of Pomo Indians: A Cultural and Historical Overview* (DeGeorgey 2007) and BLM's *Northwest California Integrated Resource Management Plan* (King et al. 2016); also see Appendix 3.3.12-1, which contains Tribal letters to PG&E. This section describes the arrival of Euroamericans to the ancestral territories of California Indians[1] discussed in the previous section and the impacts this had on their culture, lifeways, and resources. A brief overview of U.S. and state government policies regarding Tribal lands and rights is provided for context on where contemporary Tribes and Tribal members reside, own land, and have access to their traditional homelands and resources.

Beginning in the early nineteenth century, American, Russian, and English fur trappers arrived in this region and coastal areas in the Project vicinity in search of sea otter and other furs. The earliest fur trappers to settle along the north-bay coast were Russian fur traders. According to Winn (1986), "In March 1811, a large sailing ship carrying 25 Russian and eighty [sic] Alaskan natives came ashore, set up a temporary camp, and began building houses and a wooden stockade" (DeGeorgey 2007:43); this camp became Fort Ross, located approximately 100 mi. south of the Project. Local Kashaya Indians referred to the area as *Meteni*. Russians who came to the area

[1] The terms Native Americans, California Indians, Indians, Tribes, and Natives are used interchangeably in this section to describe the Indigenous peoples and groups living within the Project vicinity during Euroamerican invasion.

hunted sea otter, grew wheat and other crops, and traded with Spanish in San Francisco. As a result of this influx of Russian fur trappers, by 1820, the sea otter population was depleted and local hunting became relatively unproductive. In 1833, John Work's expedition for the Hudson's Bay Company was one the first recorded interactions between whites and California Indians of Mendocino County (DeGeorgey 2007).

When the earliest Euroamerican settlers entered the Project area, the Spanish had already established governance over the southwestern portion of "Alta California" for several decades (DeGeorgey 2007). This was part of their expansionist plan "for missionaries to establish missions and civilize the Indians, but also for soldiers to found frontier outposts and settlers to start farming communities" (Robinson 1948:33). Over time, approximately 21 missions were established throughout California. The northernmost outpost, Mission San Francisco Solano, was founded in Sonoma on July 4, 1823. From there, "the Spanish made expeditions into Sonoma, Mendocino, and Lake counties, and from these areas they captured Indians for the missions" (DeGeorgey 2007:44; see also Cook 1943). Numerous massacres occurred against the Pomo and Wappo people in the Clear Lake region (DeGeorgey 2007).

The Mexican government began issuing land grants under the jurisdiction of pueblos and presidios to a number of early settlers. By 1838, Mexicans had settled on Clear Lake. Salvador Vallejo established a large ranch in Big Valley. Cattle were brought to Vallejo's ranch, and Native men were captured and made to serve as ranch-hands. Native men who refused to become "laborers, vaqueros, and servants" were murdered. Others who were captured died of diseases brought by Europeans, such as smallpox and cholera, contributing to the rapid population decline of California Natives during this time (DeGeorgey 2007). By 1846, when California was annexed to the U.S., much of Alta California was still a Mexican territory, and the majority of "the population was of Mexican, Spanish, or Native American ancestry" (King et al. 2016:115).

In 1850, shortly after California became a U.S. state, Mendocino County was established. After that time, interactions between non-Natives and Natives became a regular occurrence in the area. Settlers began moving into abundant and rich environments cultivated for thousands of years by Native Californians to raise cattle, horses, and hogs. Problems quickly developed between the settlers and Natives. In 1850, California became a state and an act "for the Government and Protection of Indians" was passed by state legislature. This act allowed Natives, even children, to be arrested for being "vagrant[s]," and any local justice of the peace was then able to "hire" them out for labor, "effectively arranging for the sale of Indians into slavery ... This same act prohibited the conviction of any white man for an offense upon the testimony of an Indian" (DeGeorgey 2007:59).

The U.S. Congress appointed commissioners to negotiate treaties with the various Tribes to quell conflicts. In a short amount of time, 18 treaties were negotiated between the state and Tribes throughout much of California. These treaties established reservations, promised federal aid, and guaranteed the continuation of traditional hunting and fishing rights. However, the treaties were never ratified by the U.S. Senate, which received pressure from the California state government, which wanted to continue protecting the interests of settlers (DeGeorgey 2007).

The Indian reservation that was established in Mendocino encompassed 25,000 acres between the Noyo and Ten Mile rivers, where present-day Fort Bragg is located, approximately 66 mi. west of the Potter Valley Powerhouse. By mid-1856, hundreds of California Indians and Tribes relocated to the Mendocino Reservation, including Pomo, Yuki, and other Tribes extending to Eureka and Chico. This was followed by the creation of the Nome Cult Farm in Round Valley (north of the Project) in 1858 as “an administrative extension of the Nome Lackee Reservation” (DeGeorgey 2007:52). By 1860, California Indian groups were “periodically rounded up and ‘driven’ like cattle to the Nome Cult Farm from their various homelands in Northern California” (DeGeorgey 2007:53). Numerous Tribes were forcibly moved to Round Valley, including “the Yuki, the Northern Pomo of the Little Lake, Sherwood, and Potter Valleys, the Wappo from the Geyserville area, the Cahto of Laytonville, the Wailaki of southern Humbolt County, the Huchnom of northern Redwood Valley, the Yana and Yahi of Mill Creek, the Nomlaki of the Paskenta-Newville area, the Konkow Maidu from the Chico and Oroville area, and the Auchomowi or Pit River Tribes from Modoc and Shasta counties” (DeGeorgey 2007:53). Additionally, Pomo Indians from Mendocino and Lake counties were relocated to the Nome Cult Farm in Round Valley. These early reservations and rancherias[2] were strife with corruption and mismanagement. With thousands of California Indians forcibly relocated to reservations, continued brutality toward them, and the lack of aid from the California or U.S. governments, reservations quickly became places of “disease, starvation, cruelty, and anarchy” (DeGeorgey 2007:54).

During this time, between 1856 and 1860, the “Mendocino War” marked a period of intense violence against California Indians by settlers, who formed local militias, one being the Eel River Rangers (Jarbow 1859). The outcome of the “Mendocino War” included “the deaths of hundreds of Yuki and other Indian people in the Round Valley vicinity [...]; the 1860 massacre of nearly an entire Wyot village on Tuluwat (Gunther) Island in Humboldt Bay [...]; the near-annihilation of almost the entire Sinkyone tribe at Needle Rock on the Mendocino Coast [...]; and equally tragic events at Burnt Ranch on the Trinity River, Bloody Island in Clear Lake, and countless other locations” (King et al. 2018:122). When Tribes and Native people retaliated against attacks and massacres, white settlers convinced the U.S. military to protect them from Natives, resulting in “no fewer than 13 US military forts [being] established in northwestern California between 1850 and 1865” (King et al. 2018:123). From some of these forts, the U.S. military worked with white settlers and ranchers to attack Native camps and villages, forcing them to retreat into the mountain regions (King et al. 2018). Finally, in the late 1850s, the U.S. Army began assigning troops in the Mendocino area, including to Cape Mendocino, the Mendocino Reservation, and at the Nome Cult Farm in Round Valley, to “protect the Indians from extermination” (DeGeorgey 2007:55). However, the presence of the U.S. Army did little to deter whites from hunting, attacking, and murdering Natives (DeGeorgey 2007).

[2] Passage of the General Allotment Act in 1887 opened part of the limited lands in California to non-Indian settlement. In 1905, the public was finally advised of the 18 unratified treaties. Citizens sympathetic to the economic and physical distress of California Indians encouraged Congress to pass legislation to acquire isolated parcels of land for homeless California Indians. Between 1906 and 1910, a series of appropriations were passed that provided funds to purchase small tracts of land in Central and Northern California for landless Indians of those areas. The land acquisitions resulted in what has been referred to as the Rancheria System in California (BIA 2024a).

In 1862, the Homestead Act was passed:

> *[It]...allowed private individuals to file entry claims on public lands, and then over five years 'prove up' their entry by physically occupying and improving the land. In some cases, this included building a cabin and farming. After meeting the conditions set by the government, the individual could then receive a patent to the land, at which point it became their private property.* (Hildebrandt et al. 2018:111)

Federal Indian policy during the period from 1870 to 1900 marked a departure from earlier policies that were dominated by removal, treaties, reservations, and war. The Dawes Act was passed in 1887. This new policy focused specifically on breaking up reservations and Tribal lands by granting land allotments to individual Native Americans and encouraging them to take up agriculture. Native groups in the Project area also purchased land in 1879; one group bought a place near Ukiah that later became known as Pinoleville. Others lived where they could in Potter Valley, along the Eel River, or in other areas, with many provided for by the ranchers for whom they worked (DeGeorgey 2007).

Native people and groups continued in more or less the same lifestyle, many finding work in the hop fields and pear orchards or picking beans, with most enjoying a reputation for being good workers. They continued to move around with the seasons, working and going to the coast for seafoods as they had always done. Fish, meats, and acorns were still stored for winter. Other traditional foods were gathered. Women made baskets for sale to white collectors. Some of the descendants of Potter Valley people stayed in Potter Valley, while some lived in Ukiah Valley or other locations, moving about as was practical for each family. Some people who had been relocated to reservations in the 1850s moved back to their traditional homelands (DeGeorgey 2007).

The approaches of governmental agencies like BIA toward the Indian people in general were slowly evolving. In the 1930s, BIA began to make efforts to encourage Indians living on reservations and rancherias to organize themselves and run their own affairs. The Indian Reorganization Act (IRA) of 1934 was passed to "conserve and develop Indian lands and resources; to extend to Indians the right to form business and other organizations; to establish a credit system for Indians; to grant certain rights of home rule to Indians; to provide for vocational education for Indians; and for other purposes" (National Archives 2024). Although many Tribes accepted the provisions of the IRA, few California Tribes benefited economically from the IRA because of the continuing inequities in funding of federal Indian programs (BIA 2024a).

The BIA states that:

> *Beginning in 1944, forces within the BIA began to propose partial liquidation of the Rancheria system. Even the limited efforts to address the needs of California Indians at the turn of the century and again through passage of the IRA were halted by the federal government when it adopted the policy of termination. California became a primary target of this policy when Congress slated forty-one (41), California Rancherias for termination pursuant to the Rancheria Act of 1958.* (BIA 2024a)

Under the Rancheria Act of 1958 and Indian Termination Policy, Tribal governments under BIA were terminated and their rancheria lands distributed among the people assigned to the lots at the time of termination. Residents agreed because they were promised services such as sewer, water, roads, and education. However, these services were not provided, and the newly acquired private Indian lands were heavily taxed by the state and county. Under the direction of the California Indian Legal Society, lawsuits were brought against BIA by California Indians seeking restoration of their status. Potter Valley was included with 16 other Tribes in the Tillie Hardwick et al. v. the United States of America et al. case, which decided that those Tribes would become federally recognized once again and receive benefits from the federal government (Potter Valley Tribal Office, Tillie Hardwick file referenced in DeGeorgey 2007:64).

Hydroelectric Development

The construction of the Potter Valley Hydroelectric Project by the Eel Power and Irrigation Company began in 1905 to support farming businesses in the region by supplying inexpensive power to run flour mills, pumping plants, and farm machinery and storing and diverting water for irrigation. The dams greatly affected native migrating anadromous fish such as salmon, steelhead, and lamprey (see Section 3.3.3 for additional information on fish and aquatic species) as well as the already heavily impacted Tribal lifeways and food sources within the Eel and East Branch Russian rivers. In May 1908, 1 month after the power plant began operations, a spring run of lamprey worked their way upstream "into the powerhouse and vast numbers located themselves beneath the dynamos… and here they congregated to such an extent that the mass of wiggling eels was five feet deep" (*Dispatch Democrat* 1908).

Following the completion of the powerhouse, additional transmission and distribution lines were constructed throughout the area. By 1920, Van Arsdale Reservoir had silted to the point of reducing summer flow through a tunnel. In response, construction began on Scott Dam, 12 mi. upstream from the tunnel. Stone & Webster, a Chicago-based construction firm, completed Scott Dam in 1921 and inundated the site of the town of Hullville (Gravelly Valley). The reservoir created by Scott Dam greatly increased storage capacity for the Potter Valley Powerhouse and led to year-round operation; however, it inundated ethnographic villages such as *Onkolukomno'm* or *niitc-iikom* in Gravelly Valley.

Along with power, water sales were a consideration in the construction of Van Arsdale Reservoir and Lake Pillsbury. With a reliable source of water from the Eel River, the Potter Valley Irrigation District was formed, and an agreement was reached between Snow Mountain Co. and the Potter Valley Irrigation District to supply water to farmlands in the valley. Two main irrigation canals were constructed down the east and west sides of Potter Valley.

PG&E purchased Snow Mountain Co.'s assets in 1930. With the exception of alterations to the exterior of the powerhouse and various upgrades to improve system efficiency and reliability, in general, the overall electrical power generation system remains largely unchanged since its original construction.

3.3.12.5 Previously Documented Ethnographic Villages and Habitation Sites within the Study Areas

According to site predictive models developed by King et al. (2016) and ethnographic information from Barrett (1908), Foster (1944), Kroeber (1925), Loud (1918), and McCarthy (1982, 1985) there is a high probability for Tribal resources such as ethnographic villages, fishing sites, ceremonial areas, archaeological sites, buried archaeological sites and TCPs in all the Tribal resources SAs, especially the Eel River corridor as well as "Gravelly Valley (Lake Pillsbury) and the surrounding drainage of the South Eel River including the Rice Fork" (McCarthy 1982:60). Archaeological records and cultural reports downloaded from the PG&E Confidential Cultural Resources Database (see Section 3.3.11 for details of archaeological and built-environment resources) were reviewed to describe existing and probable ethnographic villages, and these are summarized below utilizing the cultural resources SAs, which differ slightly from the Tribal resources SAs.

Cultural SA: FERC Project boundary plus 0.5-mi. buffer

Site records and reports indicate the possibility of 12 habitation sites (possible ethnographic villages) in this portion of the Project area. Archaeological evidence across these sites consists of house pits, round houses, midden, lithic scatters, bone fragments, fire-cracked rock, groundstone, cooking stones, steatite, beads, hopper mortar, burials, and rock outcroppings. Known, named ethnographic village sites within this area include *Mumeme't* (confirmed in site records P-17-000431 and P17000432) and *Lil'kool* or *kalil'yakai* (Northern Pomo dialect name), which was located at a point about a quarter of a mile upstream from John Day's on the Eel River. Barrett suggests that the two Pomo villages *Uwului'me* and *Hunkati'tc* were located east of Salmon Creek, which indicates that they are likely submerged under present-day Lake Pillsbury (Barrett 1908: 333). There is also an unnamed Pomo village site (P-23-002247/CA-MEN-2547).

Cultural SA: Eel River downstream of Project to Pacific Ocean plus 0.5-mi. buffer on either side

Site records and reports suggest the possibility of 26 habitation sites (possible ethnographic villages) in this portion of the Project area. Some of these sites extend across both the FERC Project Boundary and Eel River Tribal SAs, including *Mumeme't* and *Lil'kool.* Archaeological evidence across sites within this area consists of house pits, round houses, midden, lithic scatters, bone fragments, fire-cracked rock, groundstone, cooking stones, steatite, beads, hopper mortar, burials, rock outcroppings, and petroglyphs.

Cultural SA: East Branch of the Russian River to Lake Mendocino plus 0.5-mi. buffer on either side

Site records and reports suggest the possibility of 11 habitation sites (possible ethnographic villages) in this SA. Archaeological evidence across sites within this area consists of house pits, midden, lithic scatters, animal bones, shell, groundstone, steatite, beads, hopper mortar, burials, habitation refuse, and petroglyphs. There are several sites thought to be associated with Pomo villages within the area, which have been mapped Barret (1908:333) and documented in the following site records: P-23-002247/CA-MEN-2547, P-23-002939/CA-MEN-549, P-23-004337/CA-MEN-3340, and P-23-004338/CA-MEN-3341.

3.3.12.6 California Indian Tribes

As discussed above, California Indian Tribes in the Project region have fought to recover their traditional lands, cultural heritage, and federal status. Fifty-three Tribes have been identified as having potential cultural ties and association to lands in the Tribal resources SAs (see Table 3.3.12-1). These were identified using a variety of sources including a recent NAHC response (NAHC 2024), review of Tribal government websites, BLM GLO Land Patent Search, BIA records, ethnographic records and maps, previous PG&E relicensing Tribal outreach and consultation meetings (2016–2018), and recent Tribal responses to PG&E's submittal of the Initial Draft Surrender Application.

Tribes with possible cultural ties to the lands in the Tribal resources SAs are both federally recognized and non-recognized. A "federally recognized Tribe" is any Tribe, band, nation, or other organized Indian group or community of Indians (43 U.S. Code 1601 *et seq.*) that is recognized as eligible for the special programs and services provided by the United States (see e.g., 43 CFR Part 10.2[b][2]). Non-recognized Tribes and other California Indian groups still retain distinct identities and maintain long cultural ties with the Project vicinity and surrounding region.

Table 3.3.12-1. California Indian Tribes that may be affected by the Project.

Tribe	Contact	Contact Information/Address
Bear River Band of Rohnerville Rancheria	Josefina Frank	josefinafrank@brb-nsn.gov
Bear River Band of Rohnerville Rancheria	Melanie McCavour	thpo@brb-nsn.gov
Big Lagoon Rancheria	Virgil Moorehead	vmoorehead@earthlink.net
Big Valley Band of Pomo Indians of the Big Valley Rancheria	Flaman McCloud Jr.	chairman@big-valley.net
Big Valley Rancheria of Pomo Indians	Anthony Jack	ajack@big-valley.net
Big Valley Rancheria of Pomo Indians	Baltsuwin Brown	2726 Mission Rancheria Road, Lakeport, CA 95453
Blue Lake Rancheria	Jacob Pounds	jpounds@bluelakerancheria-nsn.gov
Cachil Dehe Band of Wintun Indians of the Colusa Indian Community	Wayne Mitchum Jr.	asmelser@colusa-nsn.gov
Cachil Dehe Band of Wintun Indians of the Colusa Indian Community	Jennie Mitchum	jmitchum@colusa-nsn.gov
Cahto Tribe	Mary Norris	chair@cahtotribe-nsn.gov
Cahto Tribe	Kendra Campbell	secretary_treasurer@cahtotribe-nsn.gov
Cahto Tribe	Tasheena Sloan	vicechair@cahtotribe-nsn.gov

Tribe	Contact	Contact Information/Address
Cahto Tribe	Aimie R. Lucas	P.O. Box 1239, Laytonville, CA 95454
Cahto Tribe	Richard J. Smith	info@cniga.com
Cher-Ae Heights Indian Community of the Trinidad Rancheria	Amy Atkins-Kelley	aatkins@TrinidadRancheria.com
Cher-Ae Heights Indian Community of the Trinidad Rancheria	Garth Sundberg	gsundberg@TrinidadRancheria.com
Cher-Ae Heights Indian Community of the Trinidad Rancheria	Rachel Sundberg	rsundberg@TrinidadRancheria.com
Cloverdale Rancheria of Pomo Indians	Patricia Hermosillo	info@cloverdalerancheria.com
Cortina Rancheria – Kletsel Dehe Band of Wintun Indians	Charlie Wright	P.O. Box 1630 Williams, CA 95987
Coyote Valley Band of Pomo Indians	Richard Campbell	vc@coyotevalley-nsn.gov
Coyote Valley Band of Pomo Indians	Michael Hunter	P.O. Box 39 / 7901 Hwy. 10, North Redwood Valley, CA 95470-0039
Dry Creek Rancheria of Pomo Indians	Sherrie Smith-Ferri	sherries@drycreekrancheria.com
Elem Indian Colony Pomo Tribe	Agustin Garcia	k.cole@elemindiancolony.org
Elem Indian Colony Pomo Tribe	Kim Cole	k.cole@elemindiancolony.org
Elem Indian Colony Pomo Tribe	Thomas Brown	t.brown@elemindiancolony.org
Elk Valley Rancheria	Crista Stewart	cstewart@elk-valley.com
Elk Valley Rancheria	Dale Miller	dmiller@elk-valley.com
Elk Valley Rancheria	Kevin Mealue	kmealue@elk-valley.com
Elk Valley Rancheria	LaWanda Green	lgreen@elk-valley.com
Estom Yumeka Maidu Tribe of the Enterprise Rancheria	Glenda Nelson	info@enterpriserancheria.org
Estom Yumeka Maidu Tribe of the Enterprise Rancheria	Nelson Smith	nelsons@enterpriserancheria.org
Grindstone Rancheria of Wintun-Wailaki	Ronald Kirk	P.O. Box 63, Elk Creek, CA 95939
Guidiville Rancheria of California	Bunny Tarin	admin@guidiville.net
Guidiville Rancheria of California	Michael Derry	historian@guidiville.net
Habematolel Pomo of Upper Lake	Hope Marcks	hmarcks@hpultribe-nsn.gov
Habematolel Pomo of Upper Lake	Robert Geary	rgeary@hpultribe-nsn.gov
Habematolel Pomo of Upper Lake	Danielle Cirelli	P.O. Box 516, Upper Lake, CA 95485
Habematolel Pomo of Upper Lake	Sherry Treppa	P.O. Box 516, Upper Lake, CA 95485
Hoopa Valley Tribe	Keduescha Lara-Colegrove	hvt.thpo@hoopa-nsn.gov

Tribe	Contact	Contact Information/Address
Hopland Band of Pomo Indians	Lyesha Miller	selliott@hoplandtribe.com
Hopland Band of Pomo Indians	Sonny Elliott	sjelliott@hoplandtribe.com
Hopland Band of Pomo Indians	Ramon Billy	thpo@hoplandtribe.com
InterTribal Sinkyone Wilderness Council	Hawk Rosales	info@sinkyone.org
Karuk Tribe	Alex Watts-Tobin	atobin@karuk.us
Karuk Tribe	Russell Attebery	battebery@karuk.us
Karuk Tribe	Bill Tripp	btripp@karuk.us
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Anthony Macias	anthony@stewartspoint.org
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Dino Franklin Jr.	dino@stewartspoint.org
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Jessica Chaves	jessica@stewartspoint.org
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Vaughn Pena	vaughn@stewartspoint.org
Koi Nation of Northern California	Dino Beltran	dbeltran@koination.com
Koi Nation of Northern California	Darin Beltran	kn@koination.com
Koi Nation of Northern California	Robert Morgan	robmorgan@koination.com
Koi Nation of Northern California	Rob Morgan	robs_norcal@yahoo.com
Manchester Band of Pomo Indians of the Manchester Rancheria	Jaime Cobarrubia	P.O. Box 623, Point Arena, CA 95468
Manchester Band of Pomo Indians of the Manchester Rancheria	Ariel Escalera	ariel.escalera@mpapomotribe.org
Manchester Band of Pomo Indians of the Manchester Rancheria	Tisha Jones	tisha.jones@mpapomotribe.org
Manchester Band of Pomo Indians of the Manchester Rancheria	Paula Figueroa	24 Mamie Laiwa Drive, Point Arena, CA 95468
Melochundum Band of Tolowa Indians	Tribal Representative	P.O. Box 388, Fort Dick, CA 95538
Middletown Rancheria of Pomo Indians of California	Michael Rivera Jr.	mlrivera@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Stephanie L. Reyes	THPO@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Jose Simon III	jsimon@middletownrancheria.com; sshope@middletownrancheria.com
Middletown Rancheria of Pomo Indians of California	Michael Rivera	mlrivera@middletownrancheria.com

Tribe	Contact	Contact Information/Address
Middletown Rancheria of Pomo Indians of California	Tribal Historic Preservation Department	THPO@middletownrancheria.com
Mishewal-Wappo Tribe of Alexander Valley	Christi Gabaldon	1tektekh@gmail.com
Mishewal-Wappo Tribe of Alexander Valley	Scott Gabaldon	scott@g4firearms.com
Nor-Rel-Muk Wintu Nation	John Hayward	cybersonnyhayward@icloud.com
Nor-Rel-Muk Wintu Nation	Cyndie Childress	NRMWintu@gmail.com
Nor-Rel-Muk Wintu Nation	Tracy Foster-Olstad	tfoster-olstad@ncidc.org
Noyo River Indian Community	Tribal Representative	P.O. Box 91, Fort Bragg, CA 95437
Paskenta Band of Nomlaki Indians	Laverne Bill	THPO@paskenta.org / Lbill@paskenta.org
Paskenta Band of Nomlaki Indians	Andrew Alejandre	22580 Olivewood Avenue, Corning, CA 96021
Pinoleville Pomo Nation	Erica Carson	500 B Pinoleville Drive, Ukiah, CA 95482
Pinoleville Pomo Nation	Leona Willams	500 B Pinoleville Drive, Ukiah, CA 95482
Pinoleville Pomo Nation	Vack Sampsel	500 B Pinoleville Drive, Ukiah, CA 95482
Potter Valley Tribe	Michelle Lee	michelle@thecirclelaw.com
Potter Valley Tribe	Salvador Rosales	pottervalleytribe@pottervalleytribe.com
Potter Valley Tribe	Gregg Young	pvtepadirector@pottervalleytribe.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Fawn Murphy	fawn.murphy@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Kathy Dowd	kathy.dowd@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Megan Rocha	megan.rocha@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Moonchay Dowd	moonchay.dowd@resighinirancheria.com
Pulikla Tribe of Yurok People (formerly Resighini Rancheria)	Shaunna McCovey	shaunna.mccovey@resighinirancheria.com
Quartz Valley Indian Community	Harold Bennett	tribalchairman@qvir-nsn.gov
Redding Rancheria	Jack Potter	jack.potter@reddingrancheria-nsn.gov
Redding Rancheria	Lillie Lucero	lillie.lucero@reddingrancheria-nsn.gov
Redding Rancheria	Tracy Edwards	tracy.edwards@reddingrancheria-nsn.gov
Redwood Valley or Little River Band of Pomo Indians	Debra Ramirez	rvrsecretary@comcast.net
Robinson Rancheria Band of Pomo Indians	Eddie J. Crandall	tavilabasket@yahoo.com

Tribe	Contact	Contact Information/Address
Robinson Rancheria of Pomo Indians	Beniakem Cromwell	bcromwell@rrcbc-nsn.gov
Robinson Rancheria of Pomo Indians	Tribal Administrator	P.O. Box 4015, Nice, CA 95464
Round Valley Indian Tribes	Andrea Hilton	andrea@mcbainassociates.com
Round Valley Indian Tribes	Curtis Berkey	cberkey@berkeywilliams.com
Round Valley Indian Tribes	Erica Costa	ecosta@berkeywilliams.com
Round Valley Indian Tribes	Lewis Whipple	lwhipple@council.rvit.org; secretary@council.rvit.org
Round Valley Indian Tribes	Nikcole Whipple	nikcolewhipple@gmail.com
Round Valley Indian Tribes	Scott McBain	scott@mcbainassociates.com
Round Valley Indian Tribes	Scott Williams	swilliams@berkeywilliams.com
Round Valley Indian Tribes	Douglas Hutt	treasurer@council.rvit.org
Round Valley Indian Tribes	Carlino Bettega	vicepresident@council.rvit.org
Round Valley Indian Tribes	Paula Britton	77826 Covelo Road, Covelo, CA 95428
Round Valley Indian Tribes	Stephanie Britton	77826 Covelo Road, Covelo, CA 95428
Round Valley Indian Tribes Round Valley Reservation / Covelo Indian Community	James Russ	jruss@rvit.org; tribalcouncil@rvit.org
Scotts Valley Band of Pomo Indians	Shawn Davis	shawn.davis@sv-nsn.gov
Scotts Valley Band of Pomo Indians	Donald Arnold	1005 Parallel Drive, Lakeport, CA 95453
Scotts Valley Band of Pomo Indians	Gabriel Ray	1005 Parallel Drive, Lakeport, CA 95453
Scotts Valley Band of Pomo Indians	Joann Wright	1005 Parallel Drive, Lakeport, CA 95453
Scotts Valley Band of Pomo Indians	Shannon Ford	1005 Parallel Drive, Lakeport, CA 95453
Shasta Indian Nation	Sami Jo Difuntorum	culture@shastaindiannation.org
Shasta Nation	Roy Hall	10808 Quartz Valley Road, Fort Jones, CA 96032
Shebelna Band of Mendocino Coast Pomo Indians	Charlie Fales	19101 Olsen Lane, Fort Bragg, CA 95437
Sherwood Valley Rancheria Band of Pomo Indians	Javier Silva	jsilva@sherwoodband.com
Sherwood Valley Rancheria Band of Pomo Indians	Misty Cook	svbp.thpo@gmail.com
Sherwood Valley Rancheria Band of Pomo Indians	Michael Knight	190 Sherwood Hill Drive, Willits, CA 95490
Sherwood Valley Rancheria of Pomo	Valerie Stanley	svrthpo@sherwoodband.com
Tolowa Dee ni' Nation	Amanda O'Connell	amanda.oconnell@tolowa.com
Tolowa Dee-ni' Nation	Leann McCallum	leann.babcock@tolowa.com

Tribe	Contact	Contact Information/Address
Tsnungwe Council	Paul Ammon	tsnungweofcalifornia@gmail.com
Wailaki Tribe	Louis Hoaglin Sr.	P.O. Box 684, Laytonville, CA 95454
Winnemem Wintu Tribe	Caleen Sisk	caleenwintu@gmail.com
Winnemem Wintu Tribe	Mark Miyoshi	markmwinnemem@gmail.com
Wintu Tribe of Northern California	Shawna Garcia	garciawintu@gmail.com
Wintu Tribe of Northern California	Cindy Hogue	Hogue1hogue@gmail.com
Wintu Tribe of Northern California	Jeremy Hogue	jhogue1999@gmail.com
Wintu Tribe of Northern California	Melissa Rogers	norcalmelissa@hotmail.com
Wintu Tribe of Northern California	Wade McMaster	wintu.tribe1@gmail.com
Wintu Tribe of Northern California	Gary Rickard	wintun1@hotmail.com
Wiyot Tribe	Michelle Vassel	michelle@wiyot.us
Wiyot Tribe	Marnie Atkins	secretary@wiyot.us
Wiyot Tribe	Ted Hernandez	ted@wiyot.us
Yocha Dehe Wintun Nation	James Kinter	jkinter@yochadehe.gov
Yocha Dehe Wintun Nation	Leland Kinter	lkinter@yochadehe.gov
Yocha Dehe Wintun Nation	Anthony Roberts	thpo@yochadehe.gov
Yocha Dehe Wintun Nation	Yvonne Perkins	thpo@yochadehe.gov
Yokayo Tribe	Chairperson	P.O. Box 362, Talmage, CA 95481
Yuki/Wailaki	Deborah Hutt	debb_hutt@yahoo.com
Yurok Tribe	Joe James	jjames@yuroktribe.nsn.gov
Yurok Tribe	Rosie Clayburn	rclayburn@yuroktribe.nsn.us
Yurok Tribe	Yurok Tribe	P.O. Box 1027, Klamath, CA 95548

Federally Recognized Tribes

The following 39 federally recognized Tribes (listed in alphabetical order) may have an interest in the Project. Unless noted otherwise, the description of each Tribe, their ancestral land, and interests and traditional uses of the Tribal resources SAs is provided in their own words from their respective websites and other online research as cited:

- **Bear River Band of Rohnerville Rancheria:** "The Tribe was originally established in 1910 as a home for homeless, landless Native American Indians. In 1958, Rohnerville Rancheria was one of 44 tribes terminated by the Rancheria Act. In 1983, the Bear River Band of the Rohnerville Rancheria, along with 16 other California tribes, regained its federal recognition status through the Tillie-Hardwick case. While the U.S. granted federal recognition to our Tribe as a result of the lawsuit, it did not provide the Tribe with compensation for the land, resources, right and heritage/culture that was taken … Due to the newness of the Bear River Band of the Rohnerville Rancheria as a federally recognized

Indian Tribe, services provided by the Tribe to its members are limited. It is the direction of the Tribe to secure grants to develop and expand programs such as education, health, social services, housing, employment, economic development and cultural rejuvenation" (Bear River Band of the Rohnerville Rancheria 2021). The Tribal office is located within the Eel River Tribal SA near Fernbridge.

- **Big Lagoon Rancheria:** consists of Yurok and Tolowa. They are located in Humboldt County, California, and their Tribal headquarters is in Arcata [north of the Project].
- **Big Valley Band of Pomo Indians of the Big Valley Rancheria**: "are descendants of the Xa-Ben-Na-Po Band of Pomo Indians that historically have inhabited the Clear Lake area [south of the Project] for over 11,800 years" (Big Valley Band of Pomo Indians n.d.).
- **Blue Lake Rancheria:** is currently located "near the cities of Eureka and Arcata, five miles inland from the Pacific Coast, along California Highway 299 [north of the Project]. Within the aboriginal territory of the Wiyot people, the Blue Lake Rancheria was founded in 1908 as a 'refuge for homeless Indians.' The Tribe was terminated in 1958 under the Rancheria Act and then reinstated to federal recognition status in 1983. Since then, the Tribe has made a concerted effort to rebuild. Today, the Tribe has 100 acres of land in trust and thriving economic enterprises that support hundreds of local jobs, government operations and programs, economic diversification, resilience and sustainability efforts, environmental protection, and a wide array of social services" (Blue Lake Rancheria 2024).
- **Cachil Dehe Band of Wintun Indians of the Colusa Indian Community:** In 1941 when the Constitution for the Cachil DeHe Band of Wintun Indians of the Colusa Indian Community was ratified, they "resided in the heart of the Northern California's agricultural land on an 80-acre Reservation. The original site stretched along the bountiful Sacramento River, about 4 miles north of the City of Colusa on Highway 45. Two years later, the Tribe's land base increased with an additional 210 acres just 1 mile south of the original Reservation. It is at the secondary located where the current Colusa Casino and the Cachil DeHe Village complex stand today" (Colusa Indian Community Council 2013). This area is located south and east of the Project.
- **Cahto Tribe**: "The name Cahto (Kato) means loosely 'People of the Lake' or 'Lake People', and refers to an ancient lake shore where parts of the Cahto people once lived, although we, the inhabitants of the six villages of the Long Valley, called ourselves the Tlokyáhan, or 'Grass People'" (Cahto Tribe at Laytonville 2024). The Cahto Tribe is currently located in Laytonville, west of the Eel River Tribal SA and northwest of the FERC Project Boundary Tribal SA.
- **Cher-Ae Heights Indian Community of the Trinidad Rancheria:** "For thousands of years the Yurok, Wiyot and Tolowa people have lived in the coastal redwood forest region of Northern California … Year-round ceremonies were, and continue to be, central to the Yurok, Wiyot and Tolowa culture bringing families and villages together to give thanks, heal and pray. The Trinidad Rancheria [located north of the Eel River Tribal SA] was established in 1906 by U.S. Congress … In 1908, sixty acres of land along U.S. Highway 101 in Humboldt County were purchased for Indians living along the Northern California Coast. The existing Rancheria is within the aboriginal territory of the Yurok people and

includes many sacred and culturally significant areas" (Trinidad Rancheria 2024a). "Trinidad Rancheria purchased the Trinidad Harbor [north of the Eel River SA] in January 2000. Since the purchase, the Tribe has worked hard to mitigate hazardous waste and remove toxic materials left behind by previous commercial operations, and other sources of pollution such as used oil, hydraulic fluid, creosote and pollutants that affect groundwater and the Trinidad Bay" (Trinidad Rancheria 2024b).

- **Cloverdale Rancheria of Pomo Indians:** "The Cloverdale rancheria was created in 1921 when the U.S. government federally recognized the Tribe and deeded 27.5 acres on the southern edge of Cloverdale to the homeless, landless numbers … The federal government enacted the Rancheria Act of 1958, which transferred tribal communal property into private ownership, thereby destroying all cultural and tribal affiliations. Under this process of 'Termination' Cloverdale, and 43 other Rancherias in California, were eliminated … Tillie Hardwick, a Pomo Indian woman, led a class action lawsuit against the United States government on behalf of 16 illegally terminated Rancherias ... which reinstated the federal recognition of all illegally terminated Rancherias, including the Cloverdale Rancheria" (Cloverdale Rancheria 2024). The Cloverdale Rancheria is located within the Russian River watershed south of Lake Mendocino and the East Branch of the Russian River Tribal SA.
- **Cortina Rancheria - Kletsel Dehe Band of Wintun Indians:** "The Kletsel Dehe Wintun Nation is located in southwestern Colusa County [northeast of the Project]. The Nation's population at present stands at 249 tribal citizens … The Kletsel Dehe Wintun Nation's historical territory encompassed much of southwestern Colusa County totaling more than 200 square miles of oak forests, chaparral, foothills, canyons, creeks, springs, and parts of valley plains … The Nation identifies by its traditional name of Kletsel Dehe which means Home of the Ground squirrel Tribe, and by the specific name of Kletwin which means Ground Squirrel People, as well as more general names such as Wintun, Patwin and Hill-Patwin. The Nation recognizes thirteen traditional villages that once comprised the villages of Kletwin Peoples including: Klet, Ko-Te-Nah, Nik-me, Shoo-Koo-ee, Ke-der Hlab-be, Loo-Kus, Bah-kah-'Hhlab-be, Cho-Che, Wi-Ko'Sel, Oo-Le, Mun-Maht-Lah, To-e-de-he, and Yakut" (GovServ n.d.; Kletsel Dehe Band of Wintun Indians 2024).
- **Coyote Valley Band of Pomo Indians**: "…located in the heart of Mendocino County, Redwood Valley [just west of the FERC Project Boundary and East Branch of the Russian River Tribal SAs]. The reservation is approximately 82.36 acres of trust land … Nestled in the foothills alongside the east fork of the Russian River, Coyote Valley was one of several valleys running along the river's many branches" (Coyote Valley Band of Pomo Indians 2024a, 2024b).
- **Dry Creek Rancheria of Pomo Indians:** "The Dry Creek Rancheria Band of Pomo Indians is one of more than 20 independent communities that comprise the Pomo people. Ancestors of the Pomo people lived in the area of Sonoma, Mendocino and Lake counties thousands of years ago. Descendants of the early Pomo people continue as a Tribe in the Alexander Valley, and today are known as the Dry Creek Rancheria Band of Pomo Indians [located south of the Clear Lake, south of the Project]. The hunting/gathering Pomos in the Dry Creek area historically used regional plants and game for food, including clams, fish and abalone collected on trips to the coast during summer. But their primary food

source was acorns, which were gathered, stored, and processed throughout the season ... The rancheria occupies 75 steep acres between Healdsburg and Geyserville off Highway 128 — a sliver of the Tribe's historic land. Major ancestral Tribal lands containing gravesites, former villages, and sites for gathering the sedge used in basket weaving were flooded by water from the Warm Springs Dam and Lake Sonoma in 1983" (Dry Creek Rancheria Band of Pomo Indians 2024).

- **Elem Indian Colony of Pomo Tribe**: "(Po) is pulling earth the sound (Mo) means earths holes. Therefore, the word Pomo derived from people pulling earth from holes to build and have tools for trade and survival. The Elem/Pomo of Southeastern Lake County [south of the Project] is the oldest cultural site of all the Pomo Nations. As there is about 23 Pomo Tribes of Northern California covering the three Counties of Lake, Mendocino, and Sonoma. There are seven of these Pomo Tribes in Lake County alone and they still have different dialects and some the same or similar" (Elem Indian Colony 2024).
- **Elk Valley Rancheria:** "Our ancestors have lived in the Pacific Northwest, in what is now Southern Oregon and Northern California since time immemorial [north of the Project]. The Gold Rush era of the 1850's was a time of rapid and cataclysmic change for Tribes in this region. Massacres took place at several villages, along with diseases that decimated the local Indian population. Despite such upheaval and great loss of life, our culture has survived. Today, our community is thriving. During the last two decades, there has been a strong revival of our language and cultural practices. Many of our traditions have been passed down from one generation to the next and continues to be an important part of our culture today" (Elk Valley Rancheria 2023).
- **Estom Yumeka Maidu Tribe of the Enterprise Rancheria:** "…based in Oroville [east of the Project], our rich history, dedication to our community's growth, and commitment to future generations mean our Tribal Administration and various programs are set up for success. Spanning from childcare and education, to gaming and environmental protection, our team is available to support our members in any way we can" (Estom Yumeka Maidu Tribe 2024).
- **Grindstone Rancheria of Wintun-Wailaki:** are a Wintun-Wailaki Tribe located in Glenn County. They do not have an active website. Their Tribal offices are located east of the Project.
- **Guidiville Band of Pomo Indians**: are a Pomo Tribe located in Mendocino County. They do not have an active website. Their Tribal offices are located south of Lake Mendocino and south of the East Brach of the Russian River Tribal SA.
- **Habematolel Pomo of Upper Lake**: "... descend from four pre-contact Tribes known as the Xowalek, Danoxa, Yobotui and Kaiyao-Matuku. These four Tribes occupied the region of Upper Lake [south of the Project] since time immemorial. This area was known as Pomo Country" (Habematolel Pomo of Upper Lake 2024).
- **Hoopa Valley Tribe:** "The Hoopa Valley Tribe, are a Tribal Government dedicated to protecting and promoting the interests of the Hoopa Valley Indians, and cooperating and collaborating with Federal, State, and local Governments. Unlike most California Indians

the Hupa tribe was never forced, by the government of the U.S., to move off their original lands. Most of the Hupa people live on the Hoopa Valley Indian Reservation [north of the Project]. A treaty signed in 1864 with the U.S. government recognized this 141-square mile area as belonging to the Hupa...The 85,445-acre Hoopa Valley Reservation in Humboldt County is the largest Indian reservation in the State of California. The Hupa share it with some Karuk, Yurok, and other Indian tribes including descendants of Chilula, and Whilkut. Timber, farming, and livestock constitute the main economic activities, they maintain a strong tribal identity and sense of continuity with the past thanks, in part, to a continued presence in their homeland. They still practice many traditional customs, such as hunting, fishing, acorn gathering, basket and regalia making, and two World Renewal dances. Hupa language is still spoken, particularly by older people" (K'ima:w 2022).

- **Hopland Band of Pomo Indians**: "The traditional land of the Hopland Band of Pomo Indians is located in the Sanel Valley, and the surrounding areas [south of the Project] of what is now southeastern Mendocino County. This has been home to the Hopland People since the beginning of time. Sho-Ka-Wah or "east of the river" is the name of the people for themselves in the Central Pomo language" (Hopland Band of Pomo Indians 2024).
- **Karuk Tribe**: The Karuk Tribe "... still lives in its ancestral homelands along the middle part of the Klamath River channel - roughly between Weitchpec and Seiad [north of the Project]. The Karuk Ancestral Territory spans 1,053,600 acres or 1,646 square miles (planar measurement). Since our treaties were not ratified by U.S. Congress, the Tribe was not granted a reservation in 1851 or in 1979 ... In the Karuk language, the three main population centers have the ancient names of Panámniik for Orleans; Athithúfvuunupma for Happy Camp; and Kahtishraam for Yreka ... The Tribe currently has 3,751 Enrolled Tribal Members, making it the second-largest tribe in California. There are about 5,000 registered descendants" (Karuk Tribe 2020).
- **Kashia Band of Pomo Indians of the Stewarts Point Rancheria**: "... were the first inhabitants of the coastal Sonoma County area around Fort Ross [southwest of the Project]. The Kashia lived in lands that extended from the Gualala River in the North to Duncan's Point south of the Russian River. From the West, Kashia territory extended from the pacific coast over coastal mountain ranges down the Warm Springs Creek to the confluence of Dry Creek, thirty miles inland" (Kashia Band of Pomo Indians of the Stewarts Point Rancheria n.d.).
- **Koi Nation of Northern California (Lower Lake Rancheria)**: "For thousands of years, the Pomo Indians lived throughout North-Central California. Before colonization by Europeans, there were some 3,000 Pomo Indians living in the region, speaking one of three distinct languages. The ancestors of the Koi Nation, who were part of the Southeastern Pomo people, lived on the island village of Koi in Clear Lake [south of the Project]. They subsisted on an abundance of fish and game along with a variety of native vegetation" (Koi Nation of Northern California 2024).
- **Manchester Band of Pomo Indians**: "... formerly named the 'Manchester Band of Pomo Indians of the Manchester-Point Arena Rancheria', is a federally recognized Tribe of Pomo Indians in California. The Tribe is a community of Pomo Native Americans who are native to Northern California. The Aboriginal Bokeya society transformed into the contemporary

Manchester Band of Pomo" [which is located southwest of the Project] (Native Ministries International 2022a).

- **Middletown Rancheria of Pomo Indians of California**: "... was established with the purchase of one hundred eight acres of land, initiated by members of the small Tribe in July of 1910. The Tribe was appropriated by the Congressional Act for California landless Indians in 1906 ... With the establishment of the Middletown Rancheria at the turn of the century, members of other Tribal groups, such as Pomo, Wappo and Wintun joined with the People of the Tribe, either through marriage or customary adoption" (Middletown Rancheria of Pomo Indians of California 2021). Middletown Rancheria is located south of Clear Lake [south of the Project].
- **Paskenta Band of Nomlaki Indians:** "The Nomlaki people have lived on the same northern California lands for generations. We have raised children and buried loved ones here, hunted and gathered for our survival, and built shelters all throughout this region. We've spoken the Nomlaki language and traded with many other northern California tribes living across the forests and distant mountains ... Like other Tribes, we all lived freely until our contact with Europeans, which brought disease, death, and destruction ... The Paskenta Band Restoration Act extended federal re-recognition and restored our Tribal rights and privileges ... we once again exercised jurisdiction over our lands and people and negotiated to contract with the federal government for health, education, and other services. Four years later, we bought back 2,000 acres of our aboriginal land near Corning [east of the Project] ... Our people's resiliency in the face of so much historical trauma continues to inspire our hopeful future" (Paskenta Band of Nomlaki Indians 2024).
- **Pinoleville Pomo Nation**: "The roots of the Pinoleville Tribe go back to Potter Valley, a lush, abundant area called Be-lo-kai, meaning verdant valley [located within the FERC Project Boundary and East Branch of the Russian River Tribal SAs] ... In 1878, a large group of Potter Valley Pomos left the Round Valley Reservation and purchased 51 acres of land on the north side of Ukiah [south of the Project]. It was called ke-buk ke-bul, but soon came to be known as Pinoleville" (Pinoleville Pomo Nation 2020a, b).
- **Potter Valley Tribe**: consists of Pomo people in Mendocino County who were "previously known as the Little River Band of Pomo Indians and Potter Valley Rancheria of Pomo Indians of California. The Tribe is descended from the first-known inhabitants of Potter Valley which the Pomo called Ba-lo Kai" (Native Ministries International 2022b). The Potter Valley region is located within the FERC Project Boundary and East Branch of the Russian River Tribal SAs (Potter Valley Tribe 2025).
- **Pulikla Tribe of Yurok People (formerly Resighini Rancheria)**: "The Tribal Citizens of the Pulikla Tribe of Yurok People remain on the lands and waters where our ancestors have survived since noohl hee-kon (the beginning). This includes the lower Klamath River and tributary watersheds, high country, coast and lagoons along the Pacific Ocean, and the ocean off this coastline west to the horizon [north of the Project]. Our identity and cultural lifeways are inextricably tied to this place. Here, our ancestors resided in numerous villages and lived from what the earth provided. Each village has its own geographical boundaries, as well as members and descendants with traditional ownership to certain places, such as fishing holes,

mussel rocks, and acorn gathering areas ... Tribal citizens continued to practice traditional fishing, hunting and gathering activities both on Tribal land and at our usual and accustomed places throughout our ancestral territory. Fishing on the Klamath River and small tributaries, hunting and gathering from the mountains, and fishing and gathering from the coast continued to occur." The Tribal Constitution was amended in 2024 and, the Tribe is "now known as Pulikla Tribe of Yurok People" (Pulikla Tribe of Yurok People n.d.).

- **Quartz Valley Indian Community:** "The Quartz Valley Indian Community of the Quartz Valley Reservation of California ... is located in rural western Siskiyou County [north of the Project]. The Tribe is one of two federally recognized Tribes in Siskiyou County ... Tribal membership is 397 as of February 2023 ... Its original membership was drawn from Shasta and Karuk culture groups ... The reservation consists of approximately 210 acres, comprised mostly of trust land with some fee parcels. It is in a sub-valley of agricultural Scott Valley (ranching, farming, logging/forestry, recreation), about 10 miles from Fort Jones (pop. 653 in 2020) and 12 miles from Etna" (Quartz Valley Indian Community 2024).
- **Redding Rancheria:** "In 1922 the Bureau of Indian Affairs purchased the land that is now considered the Redding Rancheria [located northeast of the Project]. The purpose of this purchase was to provide a place for homeless Indians to camp and live ... Our Rancheria was unique because it included Indians from not just one tribe but Indians of Pit-River, Wintu and Yana descent. Prior to the purchase of the land by the government for Indian homes, many Indians gathered in the area to fish for salmon in Clear Creek." The Redding Rancheria is active in cultural preservation including pow wow dance and drum classes, basket weaving, reclaiming Tribal baskets and artifacts, and hosting a Big Time and ceremonial Bear Dance. The Redding Rancheria operates the Win-River Resort and Casino (Redding Rancheria 2024).
- **Redwood Valley Little River Band of Pomo Indians**: (Redwood Valley Rancheria) is "located in Redwood Valley in Mendocino County [within the FERC Project Boundary Tribal SA and near the East Branch of the Russian River Tribal SA]. For several thousand years the Tribe's ancestors lived along the West Fork of the Russian River, located north of Calpella, CA. The Tribe interacted with other Pomo Tribes located within the Russian River watershed, the Eel River watershed, and Tribes found along the coasts of the Clearlake and the Pacific Ocean" (Redwood Valley Little River Band of Pomo Indians 2024).
- **Robinson Rancheria of Pomo Indians of California**: consists "of Eastern Pomo people in Lake County, California. As the original inhabitants of California's beautiful Clearlake [south of the Project] and volcano Mt. Konocti, our land is at the heart of our culture and heritage" (Robinson Rancheria 2020).
- **Round Valley Reservation/ Covelo Indian Community**: "Round Valley has been the heart of the Yuki territory 'since time began'. The Yuki have lived on their ancestral homeland (stretching from Humboldt Bay to the upper Russian River area) for over 10,000 years prior to other Tribes immigrating into California." The Eel River remains central to the cultural identity of the Round Valley Indian Tribes. "The Yuki are thought to be the original Paleo-Indians of California. 162 years ago, neighboring Tribes were forced into Round Valley. By language family, the confederated Tribes of the Round

Valley Indian Reservation are: Yuki: Yukian Family; Pit River: Hokan Family; Pomo: Hokan Family; Nomlacki: Penutian Family; Concow: Penutian Family;Wailacki: Athabascan Family" (Round Valley Indian Tribes n.d.). The Round Valley Reservation lands are within the Eel River Tribal SA, and the reservation is located just north of the FERC Project Boundary Tribal SA.

- **Scotts Valley Band of Pomo:** "... is a landless Tribe with a current membership of nearly 300 Tribal members. The Tribal offices are located in the City of Lakeport, Lake County and the City of Concord in Contra Costa County..." [south of the Project] (Scotts Valley Band of Pomo Indians n.d.).
- **Sherwood Valley Band of Pomo**: "Sherwood Valley Rancheria is located within Aboriginal homelands we have used and occupied since time immemorial. Our homeland extends from approximately the Hwy 101 corridor, through the Redwood Forests, on to the Coast. As the original stewards of this land we retain original usufructuary rights to protect the land, air, water, and food sources upon our homeland ... Sherwood Valley Rancheria was established under Secretarial Order in 1909 [located west of the Eel River Tribal SA]. Sherwood Valley is the successor in interest to ownership of the Mendocino Indian Reservation, established by Act of Congress on March 3, 1853" (Sherwood Valley Band of Pomo Indians n.d.).
- **Tolowa Dee Ni' Nation:** "The contemporary Tolowa are citizens and governed under the Tolowa Dee-ni' Nation and with various federally recognized nations and tribes throughout the Pacific Northwest including: The Elk Valley Rancheria, The Resighini Rancheria, The Big Lagoon Rancheria, The Trinidad Rancheria, The Confederated Tribes of Siletz Oregon, The Yurok Tribe, The Blue Lake Rancheria, The Bear River Rancheria and The Hoopa Valley Reservation" (Del Norte County Historical Society n.d.).

  "Their Taa-laa-waa-dvn (Tolowa-Ancestral-Land) lays along the Pacific Coast between the watersheds of; Wilson Creek and Smith River in California and the Winchuck, Chetco, Pistol, Rogue, Elk and Sixes Rivers, extending inland up the Rogue River throughout the Applegate Valley in Oregon ... [This region is north of the Project.] Living in their ancient ancestral home of Genesis with the K'vsh-chu and Lhuk, the Tolowa Dee-ni' continue to pursue a livelihood. The Tolowa Dee-ni': support education, language, and health; continue ceremony and to procure food; acquire land and art; pursue economic development and social programs; and defend sovereignty ..." (Tolowa Dee Ni' Nation n.d.).
- **Wiyot Tribe**: "Wiyot people have lived in the Humboldt Bay region for thousands of years. The North Coast of California is rich with abundant terrestrial, riverine, estuarine, and marine resources ... Since time immemorial, the Wiyot people have lived along Shou'r (the Pacific Ocean) and around Wigi (Humboldt Bay). Until the onset of settler-colonialism in the 1850s they have lived in reciprocal relationship with over 40 miles of coastline, extending inland about 10 miles, living in balance with the plants, animals, earth, water, and air across multiple ecosystems and watersheds. Today, this unceded ancestral territory is marked by the negative effects of decades of extractive practices around fur, minerals, timber, fishing, water diversion, and more recently, real estate speculation. This has left the region to face increasing economic inequality alongside environmental degradation and

destabilization. Dishgamu Humboldt was created to address these challenges and help restore balance to Wiyot ancestral territory - now a collection of highly interdependent yet disparately governed cities and towns, as well as the population center of Humboldt County and the northern California coast. Our deeply rooted environmental knowledge and territorial-scale perspective make us uniquely equipped to address the scale and complexity of the challenges before us" (Wiyot Tribe n.d.a, n.d.b). The Wiyot Tribal offices are located at Table Bluff Rancheria just north of the Eel River Tribal SA.

- **Yocha Dehe Wintun Nation**: "Since time immemorial, our people have lived on lands today known as Yolo, Solano, Colusa, Lake and Napa Counties [south and east of the Project]. Centered in Yolo County's Capay Valley, our Northern California homeland is at the heart of our culture and heritage" (Yocha Dehe Wintun Nation 2024).
- **Yurok Tribe:** "The Yurok (Oohl) Tribe is California's largest Native American Tribe with nearly 6,500 enrolled members [located north of the Project]. We have long been celebrated as great fishermen, eelers, basket weavers, canoe makers, storytellers, singers, dancers, healers, and strong medicine people. As stewards of the land, our way was to never overharvest but to always ensure the sustainability of our food supply for future generations" (Yurok Country 2023).

  "The mission of the Yurok Tribe is to exercise the aboriginal and sovereign rights of the Yurok People to continue forever our Tribal traditions of self-governance, cultural and spiritual preservation, stewardship of Yurok lands, waters and other natural endowments, balanced social and economic development, peace and reciprocity, and respect for the dignity and individual rights of all persons living within the jurisdiction of the Yurok Tribe, while honoring our Creator, our ancestors and our descendants." The Yurok Tribe is active in revegetation and fisheries restoration along the recently undammed segment of the Klamath River (Yurok Tribe 2024).

The following 14 non-federally recognized Tribes and Tribal groups may also have an interest in the Project. Unless noted otherwise, the description of each Tribe below is provided in their own words from their respective websites:

- **Intertribal Sinkyone Wilderness Council**: "... is a Tribal non-profit consortium comprised of ten federally recognized Northern California Tribal Nations with cultural connections to the lands and waters of traditional Sinkyone and neighboring Tribal territories ... The Sinkyone Council grew from the deep intergenerational connections of this region's Indigenous Peoples with their sacred lands and waters, and from the inspiring efforts of activists, Tribal community members and others to halt logging of Sinkyone's remnant old growth rainforest, protect declining salmon and other native species, promote healing, and re-vitalize the Tribes' cultural relationships with lands and waters of the Sinkyone region ... Member Tribes of the Sinkyone Council consist of the Cahto Tribe of Laytonville Rancheria, Coyote Valley Band of Pomo Indians, Hopland Band of Pomo Indians, Pinoleville Pomo Nation, Potter Valley Tribe, Redwood Valley Little River Band of Pomo Indians, Robinson Rancheria of Pomo Indians, Round Valley Indian Tribes, Scotts Valley Band of Pomo Indians, and Sherwood Valley Rancheria of Pomo Indians" (InterTribal Sinkyone Wilderness Council 2024b, 2024c).

Sinkyone Council and its member Tribes are actively involved in numerous Tribal resource protection and revitalization programs near the Eel River Tribal SA including:

– Enacting stronger measures to protect kelp and seaweed from the increasing pressures of commercial harvesting, climate change, pollution, and other devastating impacts.

– "The Council was instrumental in the establishment of California's network of Marine Protected Areas (MPAs), the second largest network of its kind in the world. Due to activism and advocacy by the Council and many others, the California Fish and Game Commission in 2012 approved a first-of-its-kind regulation protecting Tribal traditional fishing, gathering, harvesting, and other cultural practices within specific MPAs, without imposition of the new restrictions applying to non-Tribal commercial and recreational harvesters…The Sinkyone Council, Tolowa Dee-ni' Nation, Wiyot Tribe, and Cher-Ae-Heights Indian Community of Trinidad Rancheria co-authored and published a paper for the North Coast's MPA Baseline regarding Tribal Traditional Knowledge of culturally significant marine species and ecosystems, which summarizes the results of their research conducted between 2014 and 2017. The first of its kind, this project contributes a highly relevant and groundbreaking study that utilizes Traditional Knowledge to develop a baseline characterization for key nearshore marine habitats and provides significant cultural-historical context for that baseline" (InterTribal Sinkyone Wilderness Council 2024b).

– "... protection of a vital but threatened Eel River tributary and cultural landscape within Cahto Tribal Territory. The Cahto Tribe and many others oppose a timber harvest operation planned for the watershed, which would irreparably harm critically important coho salmon populations and habitat, the redwood ecosystem, and many cultural values of the Cahto Tribe" (UC Law San Francisco 2024).

  "In December 2021, an important Land Back achievement was reached when a 523-acre area of coast redwood forestland was returned to the InterTribal Sinkyone Wilderness Council through donation by Save the Redwoods League. Designated by Sinkyone Council as Tc'ih-Léh-Dûñ (meaning 'Fish Run Place' in Sinkyone language), the land contains nearly 200 acres of old-growth redwood and critical habitat for imperiled species including marbled murrelet, coho salmon and steelhead trout. Part of the responsibility we as Indigenous Peoples have is to honor and safeguard these relatives who, like our peoples, have been here for many thousands of years" (InterTribal Sinkyone Wilderness Council 2024a).

- **Melochundum Band of Tolowa Indians:** No Tribal website or online information found. "The name 'Tolowa' is derived from *Taa-laa-welh* (*Taa-laa-wa*), a Yurok and Wiyot name from the Algonquian language for the capitol of *Yan'-daa-k'vt.* Their autonyms are dee-ni' and xvsh, meaning 'person" or 'human being'. In the political sense they are the dee-ni', which means, 'to be a citizen'" (Del Norte County Historical Society n.d.). The Tolowa are located on the California–Oregon border, near the Smith River, north of the Project.

- **Mishewal-Wappo Tribe of Alexander Valley**: is "headquartered ... in Windsor [south of the Project] and is the last remaining Wappo Tribe in existence. The Tribe now claims 357 enrolled members, all lineal descendants of 10 families who lived on the reservation in

1935." They are actively "asking the federal government to restore their federal status, benefits and historic land rights" (AAA Native Arts 2024a).

- **Nor-Rel-Muk Wintu Nation:** "The Nor Rel Muk Wintu Nation's traditional homeland lies in the headwaters of the South Fork of the Trinity River, in Trinity County, California [north of the Project]. Approximately half of the Tribe's 1,000 members still live near their ancestral lands in Trinity and Shasta Counties. Nor Rel Muk Wintu members from across the state gather annually over Memorial Day weekend, to participate in Wintu songs, dances, and traditional crafts" (Alliance for California Traditional Art 2024).
- **Noyo River Indian Community:** is located in Mendocino County near Fort Bragg, west of the Project. A Tribal website was not found.
- **Shasta Indian Nation:** "The Shasta Indian Nation is comprised of people who came from the villages of Kikacéki, a reach of Klamath River as well as Scott Valley and Shasta Valley [north and east of the Project] ... The wilderness of northwestern California and southwestern Oregon has been, and still is, the traditional homeland of the Shasta Indian people. Most traditional Shasta villages were located along the Klamath, Shasta, Salmon, and Scott Rivers, and their tributaries. The major structures of a Shasta village included the dwelling house (umma), a 'big house' (okwa-umma), the sweat house (wukwu), and the menstrual hut (wapsahuumma). Each village was integrated into a larger band, each led by a headman" (Shasta Indian Nation 2024a, 2024b).
- **Shasta Nation:** No Tribal information was found online.
- **Shebelna Band of Mendocino Coast Pomo Indians**: "We are Shebelna Pomo. We use this name because we believe it is the original name of our ancestor's band. Our ancestors indicated that we were Shubuldano and our lands were Shabaltino" (Shebelna Band of Mendocino Coast Pomo Indians n.d.). The Shebelna are currently located near Fort Bragg, west of the Project.
- **Tsnungwe Council**: "It is said that the Immortals lived at łe:ldin, 'the place where the rivers come together' ... łe:ldin became a cultural and economic center for Tribes along the Klamath, Trinity, and South Fork Rivers [north of the Project]. The Tsnungwe spoke a Hupa dialect, in the Athabascan family. Since łe:ldin was an important trade center, the Tsnungwe often spoke five or six languages: Chimariko, Wintun, Redwood, Wiyot, Hoopa Valley and South Fork Hupa. Goods from far away were brought to łe:ldin: dentalia from the state of Washington, obsidian from the Modoc Plateau, and redwood canoes from the coast were major trade items.

  We continue our strong Indian identity through participation in a number of ongoing programs and services. Cultural programs include Hupa language classes with Hoopa Valley, and the Title V Indian Education and Cultural Program in the schools for our children. Social programs include health services at the Trinity Rural Indian Health Project. We continue to work with the Northern California Indian Development Council (NCIDC) to restore federally recognized tribal status" (Tsnungwe Tribe 2019).

- **Wailaki Tribe:** A web search did not locate specific information or a Tribal website; however, some Wailaki live on the Round Valley Reservation north of the Project as well as on the Sugar Bowl Rancheria (Lakeport County, south of the Project). "Other California Southern Athapaskans also live among and have become mixed with Athapaskan Hupa or with other groups" (AAA Native Arts 2024b). The Bear River Band of Rohnerville Rancheria (Humboldt County, north of the Project) is home to some Southern Athapaskans (United Indian Health Services 2023).
- **Winnemem Wintu Tribe**: "The Winnemem Wintu are a traditional Tribe who inhabit our ancestral territory from Buliyum Puyuuk (Mt. Shasta) down the Winnemem Waywaket (McCloud River) watershed [northeast of the Project] ... In our language, Winnemem Wintu translates to Middle Water People, as the Winnemem Waywaket (McCloud River) is bounded by the Nomtipom Waywaket (Upper Sacramento River) to the west and the Pit River to the east ... When the Shasta Dam was constructed during World War II, it flooded our home and blocked the salmon runs. The Nur, or salmon, are an integral part of our lifeway and of a healthy Winnemem Waywaket watershed. As salmon people and middle water people, we advocate for all aspects of clean water and the restoration of salmon to their natural spawning grounds" (Winnemem Wintu Tribe n.d.a, n.d.b).
- **Wintu Tribe of Northern California:** "operate the Toyon-Wintu Center, a 501(c)(3) non-profit corporation. We represent the direct descendants of the Original Indigenous people known as the Wintu" [generally located northeast of the Project] (Wintu Tribe of Northern California 2024). Their federal recognition was lost, and they are working on reinstating their federal status.
- **Yokayo Tribe:** a Tribal Facebook page states: "The Yokayo Tribe of Indians are a small non-federally recognized Tribe located southeast of Ukiah [south of the Project] on their private Tribal property since before 1880" (Facebook 2024a).
- **Yuki/Wailaki Tribe:** A web search did not locate specific information or a Tribal website; however, a Facebook search found members of this Tribal group and Tribal members of the Round Valley Tribe participating in a traditional redwood canoe launch on the Eel River on June 1, 2024 (Facebook 2024b).

3.3.12.7 Tribal Lands

Tribal lands are defined as all lands within the boundaries of an Indian reservation and all dependent Indian communities (36 CFR Part 800.16[x]) and any lands held in trust for any Tribe by BIA. There are no Tribal lands that meet this definition located within or adjacent to the FERC Project boundary (BIA 2017, 2024b). BIA lands held in trust for the Round Valley Reservation are located along the Eel River Tribal SA downstream of the Project (GLO records).

3.3.12.8 Access Agreements

PG&E does not maintain access agreements with any Tribes in or within 0.25 mi. of the FERC Project boundary.

3.3.12.9 Tribal Resources and Interests

In addition to ethnographic villages and archaeological sites, contemporary Tribal resources, practices, and interests have been outlined for each Tribe in Section 3.3.12.6 and are further discussed in this section. Proposed Project activities could potentially affect Tribal resources by affecting those qualities that make these resources eligible for inclusion in the National Register of Historic Places (NRHP) or that hold significant cultural value.

Three main categories of Tribal resources include:

- **Tribal places**, which are locations associated with the ancestral past and places related to current gathering and/or hunting practices or other resource types.
- **TCPs**, which are places or properties that are eligible for inclusion in the NRHP based on their associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. National Register Bulletin No. 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*,[3] defines a TCP as "as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998:1). Examples provided in National Register Bulletin No. 38 include:
  - A location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world;
  - A location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; or
  - A rural community whose organization, buildings and structures, or patterns of land use reflect the cultural traditions valued by its long-term residents.
- **Cultural Landscapes**, which are defined as large-scale properties (districts) often consisting of multiple elements and features that when linked form an interconnected place (Advisory Council on Historic Preservation 2016). They are embedded with multigenerational cultural and historical meaning by the peoples who have traveled and used them. In addition to physical components such as archaeological resources, plants, animals, rivers, meadows, waterfalls, viewsheds, and mountain peaks, non-visible aspects of spirituality, story, memory, and audio or olfactory aspects of places are often important to how they are defined. Cultural Landscapes are often TCPs.

[3] Bulletin 38 is currently under revision, and the revised draft now uses the term "Traditional Cultural *Places*," in keeping with contemporary Tribal usage and to be consistent with the National Register of Historic *Places* (NPS 2023). The current status of the Bulletin 38 revision can be found at: ParkPlanning - National Register Traditional Cultural Places Bulletin Update (nps.gov). The revised Bulletin 38, currently in its second round of review, notes that the revision has "no change from previous versions of the TCP Bulletin in the definition of a TCP or how one is identified, documented, and evaluated for inclusion in the National Register" (NPS 2023).

Tribal government resources, which are Indian reservations, rancherias, colonies, Indian ITAs,[4] and allotments.

During previous relicensing efforts, PG&E reviewed files and databases maintained by the NAHC and BIA to determine whether any TCPs or Tribal government resources have been identified within or in the immediate vicinity of the FERC Project boundary. This initial search resulted in no documented TCPs or Tribal government resources being identified within or in the immediate vicinity of the FERC Project boundary. Additionally, the NAHC response did not identify any documented sacred lands within or adjacent to the FERC Project boundary. These results do not confirm that there are no TCPs or sacred lands within the Tribal resources SAs—often, TCPs are not recorded or registered with the NAHC and are identified through implementation of a Tribal resources or ethnographic study, which involves research, interviews, and fieldwork. Based on a review of the ethnographic and ethnohistoric context, review of cultural resource reports and archaeological site records, and feedback received from Tribes during relicensing efforts and in response to the Initial Draft Surrender Application, there is a high probability of Tribal places and TCPs being present within the Tribal resources SAs.

3.3.12.10 Potential Tribal Issues and Concerns

General Tribal issues and concerns received when PG&E was initially relicensing the Project and after PG&E submitted the Initial Draft Surrender Application in December 2023 included access to the Eel River, fish flows, fish passage, restoring Native fisheries, and potential effects to ceremonial plants and culturally important fish species, including Central California Coast coho, California Chinook, Central Coast steelhead, Pacific lamprey, and green sturgeon. Additional potential issues and concerns include effects to ethnographic village sites and archaeological resources, water quality and water allocations, invasive species management, Land Back initiatives and environmental justice, protection of Tribal traditional fishing, gathering, harvesting, and other cultural practices, and inclusion of Tribal consultation, Traditional Ecological Knowledge, co-stewardship agreements, and Tribal monitoring during Project planning, construction, decommissioning, and restoration activities. Some of these concerns were brought forth at the Tribal and agency outreach meeting that PG&E hosted on February 15, 2024, to discuss the development of the Draft Surrender Application and Conceptual Decommissioning Plan.

[4] ITAs are defined by BLM (2007:1) as "…land or a natural resource held by the Federal Government in trust, or that is restricted against alienation, for Indian Tribes, individual Indians or Alaska Natives." ITAs are, therefore, legal interests in property held in trust by the U.S. for Indian Tribes or individual Native Americans. The U.S. Secretary of the Interior, acting as the trustee, holds many assets in trust. ITAs can cover real property, physical assets, or intangible property rights. They may be lands, including reservations and public domain allotments; minerals; water rights; and claims, just to name a few. While most ITAs are on reservations, they may also be found off-reservation. ITAs cannot be sold, leased, or otherwise alienated without the U.S. government's approval. They may also be identified as historic properties (i.e., a cultural resource listed on or determined eligible for listing on the NRHP); however, an ITA is a land management/ownership status, while status as a historic property reflects its significance relative to the NRHP. ITAs can include historic properties (either as a TCP or as an archaeological site or district), but the ITA itself is not a historic property.

PG&E submitted an Initial Draft Surrender Application in November 2023 to Tribes[5] and stakeholders. Letters and comments were received from the Pinoleville Pomo Nation, Potter Valley Tribe, Round Valley Indian Tribes, and Wiyot Tribe. Tribal comments and concerns are summarized below, Tribal outreach activities are listed in Table 3.3.12-2, and letters are provided in Appendix 3.3.12.-1.

- Pinoleville Pomo Nation Tribal Requests and Concerns (letter to PG&E dated December 13, 2023):
  - Tribe requests transparency of Joint Powers of Authority on restructuring the water allocation and costs.
  - Tribe requests Russian River Watershed Tribal participation on Joint Powers of Authority board.
  - The Tribe is concerned about:
    - Future water allocations for Tribes being restricted.
    - Future water rates being increased to unmanageable levels.
    - Lack of an environmental impact study on the upper Russian River fishery and ecosystem.
    - Impacts on threatened-with-extinction Central California Coast coho, California Chinook, and Central Coast steelhead.
    - Economic and environmental planning to adapt to changing climate.
    - Downstream impacts on water quality and quantity.
    - Watershed-based planning for water conservation.
    - Russian River fishery restoration.
- Potter Valley Tribe (Letter to PG&E dated December 22, 2023): "Our primary comment to the decommissioning plan is that it does not address disposition of the land PG&E retained that was not identified as within the FERC project boundaries. The interplay between the Stewardship Council process and this Plan, in conjunction with the California Public Utilities Commission's Tribal Land Return Policy,[6] requires this Plan to be

[5] Big Valley Rancheria of Pomo Indians, Cahto Tribe, Coyote Valley Band of Pomo Indians, Elem Indian Colony of Pomo Indians, Guidiville Band of Pomo Indians, Habematolel Pomo of Upper Lake, Hopland Band of Pomo Indians, InterTribal Sinkyone Wilderness Council, Kashia Band of Pomo Indians of the Stewarts Point Rancheria, Laytonville Rancheria, Lower Lake Rancheria, Manchester-Point Arena Rancheria, Middletown Rancheria, Mishewal-Wappo of Alexander Valley, Noyo River Indian Community, Pinoleville Pomo Nation, Potter Valley Tribe, Redwood Valley Rancheria of Pomo, Robinson Rancheria Band of Pomo Indians, Round Valley Indian Tribes, Scotts Valley Band of Pomo Indians, Shebelna Band of Mendocino Coast Pomo Indians, Sherwood Valley Rancheria Band of Pomo Indians, Wailaki Tribe, Wiyot Tribe, and Yuki/Wailaki.

[6] The Tribal Land Transfer Policy allows for the transfer of land from investor-owned utilities to Native American Tribes with a historical interest in the land. When a utility begins the process of disposing of land, the policy creates an expectation that the utility will work with the NAHC to identify any Tribes whose ancestral territory the

specifically discussed with the Potter Valley Tribe, not just with an email - we need to meet in person with PG&E to discuss the impact of the Plan on the Tribe and its adjacent land."

- Round Valley Indian Tribes (Letters [2] to PG&E dated December 22, 2023):
  - Tribe supports removal of both Scott Dam and Cape Horn Dam with site restoration to pre-Project conditions and a free-flowing Eel River and fishery restored to support naturally reproducing, self-sustaining and harvestable native anadromous fish populations.
  - Tribe requests studies to inform the decommissioning plan and potential indirect effects of sediment transport and deposition downstream once Scott Dam is removed.
  - Tribe requests a collaborative approach with Tribes, PG&E, FERC, and resource agencies that include the following topics:
    - Decommissioning plan and dam removal process
    - Sediment management
    - River restoration
    - Restoration of former inundation zone of Lake Pillsbury and Van Arsdale Reservoir
    - Invasive species management
    - Aquatic species management
    - Protection of cultural and archaeological resources
    - Tribal beneficial uses and Tribal water rights
    - California Assembly Bill No. 1936, Chapter 478
    - Environmental justice
    - Tribal consultation
- Wiyot Tribe (Letter to PG&E, no date): Specific comments for the Scott Dam Area and Cape Horn Dam Area are included in the letter. These include comments on critical migration and spawning period for Pacific lamprey, coho salmon, and steelhead trout in the Eel River, fish passage, water conveyance, and river flows and sediment releases during and after dam removal, restoration of former inundation zone in Lake Pillsbury and Van Arsdale Reservoir, and more information on definition and plan for restoration activities.

land is on or is adjacent to. Once the utility identifies any interested Tribe or Tribes, the company is expected to negotiate a transfer to the Tribe before putting the land on the market. This policy, which the California Public Utilities Commission (CPUC) developed after comment from utilities and Tribes, furthers CPUC's goals of recognizing and respecting native sovereignty and of returning Tribal lands to their rightful owners (CPUC 2024).

Table 3.3.12-2. Tribal outreach activities.

Date	Type / Purpose
November 17, 2023	PG&E distributed an Initial Draft Surrender Application in November 2023 to Tribes and stakeholders.
January 18, 2024	PG&E met with agencies and Tribal representatives to provide an overview of the Project and PG&E goals, discuss the surrender process and schedule, provide updates to the application, provide stakeholder comments received, and solicit input on the Proposed Action and alternatives.
February 14, 2024	PG&E met with interested Tribal representatives and members to provide an overview of the Initial Draft Surrender Application and Decommissioning Plan and the license surrender process.
February 15, 2024	PG&E hosted a meeting to discuss the development of the Draft Surrender Application and Conceptual Decommissioning Plan.
March 2024 to September 2024	PG&E refined development of the Project description and identified SAs for environmental and cultural and Tribal resources.
May 31, 2024	PG&E sent a letter to all interested parties informing them of the extension for time request for the final draft surrender application to be submitted to FERC in January 2025 and the final surrender application to be submitted to FERC in July 2025.
September 9, 2024	PG&E hosted a technical outreach meeting to provide an update on PG&E's application, including the surrender application process, Proposed Action timeline, and application content; effects analysis approach; and potential effects and proposed environmental protection measures.
September 11, 2024	Received Native American contacts and information on whether any sacred land files were present for the Tribal resources SAs from the Native American Heritage Commission.
October 11, 2024	PG&E sent letters to additional Tribes identified by the Native American Heritage Commission describing the Project, cultural and Tribal resources SAs, summary of surrender application outreach activities, and timeline moving forward.

3.3.12.11 References

AAA Native Arts. 2024a. The Mishewal-Wappo Tribe of Alexander. Available at: The Mishewal Wappo Tribe of Alexander (aaanativearts.com).

AAA Native Arts. 2024b. California Southern Athabaskan cultures. Available at: https://www.aaanativearts.com/california-southern-athabaskan-cultures.

Advisory Council on Historic Preservation. 2016. Information paper on cultural landscapes: understanding and interpreting indigenous places and landscapes. Advisory Council on Historic Preservation, Washinton, D.C. Available at: InformationPaperonCulturalLandscapes.pdf (achp.gov). Accessed June 3, 2024.

Alliance for California Traditional Art. 2024. Nor Rel Muk Wintu Nation. Available at: https://actaonline.org/profile/nor-rel-muk-wintu-nation/.

Barrett, Samuel A. 1908. The ethnogeography of the Pomo and neighboring Indians. University of California Publications in American Archaeology and Ethnography 6 (1): 1–332.

Baumhoff, Martin A. 1958. California Athabascan groups. Anthropological Records 16(5). University of California Press.

Bean, Lowell John and Dorothea Theodoratus. 1978. Western Pomo and northeastern Pomo. In Handbook of North American Indians, Vol. 8, California, edited by R.F. Heizer, pp. 289–305. Smithsonian Institution, Washington, D.C.

Bear River Band of the Rohnerville Rancheria. 2021. Our story. Available at: https://www.bearriverrancheria.org/our-story.

BIA (U.S. Bureau of Indian Affairs). 2017. Personal contact – Pacific Gas and Electric Company Cultural Resource Specialist Ms. Leslie Sakowicz and Bureau of Indian Affairs Regional Archaeologist Dan Hall concerning presence of Indian Trust Lands or other assets within or adjacent to the Project. January 10.

BIA (U.S. Bureau of Indian Affairs). 2024a. Who we are - Pacific regional office. Available at: Who We Are | Indian Affairs (bia.gov). Accessed August 6, 2024.

BIA (U.S. Bureau of Indian Affairs). 2024b. Reservation map, California Indian Trust land, Pacific region. Available at: BIA Tract Viewer (geoplatform.gov). Accessed July 12, 2024.

Big Valley Band of Pomo Indians. n.d. Big Valley Band of Pomo Indians: About us. Available at: www.bvrancheria.com/about_us.

BLM (Bureau of Land Management). n.d. General Land Office records: land patents. Available at: https://glorecords.blm.gov/search/default.aspx.

Blue Lake Rancheria. 2024. About. Available at: https://www.bluelakerancheria-nsn.gov/about/.

Cahto Tribe at Laytonville. 2024. Who we are. Available at: About – cahtotribe-nsn.gov.

Cloverdale Rancheria. 2024. Home. Available at: https://cloverdalerancheria.com/.

Colusa Indian Community Council. 2013. Heritage. Available at: https://www.colusa-nsn.gov/government/heritage/.

Cook, Sherburne F. 1956. The aboriginal population of the north coast of California. University of California Anthropological Records 16(3):81–130.

Cook, Sherburne F. 1943. The conflict between the California Indian and white civilization, II. The physical and demographic reaction of the non-mission Indians in colonial and provincial California. Ibero-Americana 22. Berkeley, California.

Coyote Valley Band of Pomo Indians. 2024a. Tribal government. Available at: www.coyotevalleytribe.org.

Coyote Valley Band of Pomo Indians. 2024b. History & culture. Available at: https://www.coyotevalleytribe.org/blank.

CPUC (California Public Utilities Commission). 2024. Tribal land transfer policy. Available at: Tribal Land Transfer Policy (ca.gov).

Del Norte County Historical Society. n.d. The Tolowa Tribe and other nations. Available at: https://delnortehistory.org/tolowa/.

DeGeorgey, Alex. 2007. Potter Valley Tribe of Pomo Indians: A cultural and historical overview. Report. Sentinel Archaeological Research, LLC.

DeGeorgey, Alex. 2005a. P-23-004337/CA-MEN-3340. Site record: State of California, Department of Parks and Recreation. February 22, 2005. Sentinel Archaeological Research, LLC.

DeGeorgey, Alex. 2005b. P-23-004338/CA-MEN-3341. Site record: State of California, Department of Parks and Recreation. February 22, 2005. Sentinel Archaeological Research, LLC.

Dispatch Democrat. 1908. May 1908.

Dry Creek Rancheria Band of Pomo Indians. 2024. History. Available at: History – Dry Creek Rancheria.

Elem Indian Colony. 2024. Cultural resources & events. Available at: http://www.elemindiancolony.org/cultural-resources-events/.

Elk Valley Rancheria. 2023. Our history and culture. Available at: Our History & Culture - Elk Valley Rancheria.

Elsasser, Albert B. 1978a. Mattole, Nongatl, Sinkyone, Lassik, and Wailaki. In Handbook of North American Indians, Vol. 8, edited by R.F. Heizer, pp. 190–204. Smithsonian Institution, Washington, D.C.

Elsasser, Albert B. 1978b. Wiyot. In Handbook of North American Indians, Vol. 8, edited by R.F. Heizer, pp. 155–163. Smithsonian Institution, Washington, D.C.

Estom Yumeka Maidu Tribe. 2024. Home. Available at: Enterprise Rancheria – Federally Recognized Indian Tribe Since 1915.

Facebook. 2024a. Yokayo Tribe of Indians. Available at: https://www.facebook.com/p/Yokayo-Tribe-of-Indians-100083470986119/.

Facebook. 2024b. Native Health in Native Hands. Available at: https://www.facebook.com/NativeHealthNativeHands/.

Foster, George. 1944. A summary of Yuki culture. University of California Anthropological Records 5(3):155–244.

Gifford, Edward, J. 1926. Clear Lake Pomo society. University of California Publications in American Archaeology and Ethnology 18(1):287–390.

Goddard, Susan and John Holson. 1993. Potter Valley fish screen cofferdam archaeological survey. Draft final report. BioSystems Analysis, Inc. Tiburon, CA.

Google Earth Pro. 2024. Lake County. 39.419920, -122.953329 (WGS84). Imagery Date: October 29, 2023. Accessed December 23, 2024.

GovServ. n.d. Kletsel Dehe Wintun Nation. Available at: https://www.govserv.org/US/Williams/367420700001598/Kletsel-Dehe-Wintun-Nation.

Habematolel Pomo of Upper Lake. 2024. Available at: https://www.hpultribe-nsn.gov/about/.

Hildebrandt, William, Cindy Baker, Mary Maniery, Sarah Heffner, and Jerome King. 2018. A cultural resources overview of the Berryessa Snow Mountain National Monument. Prepared for the Bureau of Land Management and Mendocino National Forest.

Hopland Band of Pomo Indians. 2024. Our culture. Available at: www.hoplandtribe.com.

InterTribal Sinkyone Wilderness Council. 2024a. News. Available at: https://sinkyone.org/news.

InterTribal Sinkyone Wilderness Council. 2024b. Our responsibility to past… present… and future generations of all life. Available at: https://sinkyone.org/about.

InterTribal Sinkyone Wilderness Council. 2024c. Our work. Available at: https://sinkyone.org/achievements.

Jarbow, W.S. 1859. Captain W.S. Jarbow to Major Edward Johnson (copy to Governor Weller), August 13, 1859, Indian War Files.

Karuk Tribe. 2020. Tribal government profile and summary. Available at Karuk-Tribal_Government_Fact_Sheet_2020.final.pdf.

Kashia Band of Pomo Indians of the Stewarts Point Rancheria. n.d. About the Kashia Band of Pomo Indians. Available at: www.stewartspoint.org/wp2.

K'ima:w: An Entity of the Hoopa Valley Tribe. 2022. Hoopa Valley Tribe. Available at: https://www.kimaw.org/hvt.

King, Jerome H., William R. Hildebrandt, and Sharon A. Waechter. 2016. Part I – overview: A class I cultural resources overview and existing information inventory for the Northwest California Integrated Resource Management Plan. Bureau of Land Management, Redding and Arcata Field Offices. Far Western Anthropological Research Group, Inc.

Kletsel Dehe Band of Wintun Nation. 2024. About the tribe. Available at: Kletsel Dehe Wintun Nation | Tribal History.

Koi Nation of Northern California. 2024. Tribal history. Available at: https://www.koinationsonoma.com/history/.

Kroeber, Alfred L. 1939. Cultural and natural areas of native North America. Edited by A.L. Kroeber, R.H. Lowe, and R.L. Olson. University of California Publications in American Archaeology and Ethnology 38. University of California Press, Berkeley.

Kroeber, Alfred L. 1933. Native Tribes, groups, dialects, and families of California in 1770. Map. University of California, Berkeley, CA.

Kroeber, Alfred L. 1932. The Patwin and their neighbors. University of California Publications in American Archaeology and Ethnology 29(4):253–423.

Kroeber, Alfred L. 1925. Handbook of the Indians of California. Bulletin 78, Bureau of American Ethnology of the Smithsonian Institution, Washington, D.C. Reprinted in 1976 by Dover Publications, Inc., NY.

Kunkel, P.H. 1962. Yokuts and Pomo political institutions: A comparative study. Unpublished Ph.D. dissertation in Anthropology. University of California, Los Angeles.

Loud, Llewellyn L. 1918. Ethnogeography and archaeology of the Wiyot Territory. University of California Press, Berkeley.

McCarthy, Helen. 1985. Ethnography. In Ethnography and Prehistory of the North Coast Range, California, H. McCarthy, W. Hildebrandt, and L. Swenson, editors. Center for Archaeological Research at Davis No. 8. University of California, Davis.

McCarthy, Helen. 1982. Chapter 5: Ethnography. In Cultural Resource Overview of the Mendocino National Forest and East Lake Planning Unit (BLM).

McLendon, Sally and Robert L. Oswalt. 1978. Pomo: Introduction. In Handbook of North American Indians. Vol. 8, edited by R.F. Heizer, pp. 274–288. Smithsonian Institution, Washington, D.C.

Mendocino County. 2016. General Services Agency, Information Services Division, GIS Program. Parcel data layer extracted November 7.

Middletown Rancheria of Pomo Indians of California. 2021. History & culture. Available at: https://middletownrancheria-nsn.gov/history-culture/.

Miller, Virginia P. 1978. Yuki, Huchnom, and Coast Yuki. In Handbook of North American Indians. Vol. 8, edited by R.F. Heizer, pp. 249–255. Smithsonian Institution, Washington, D.C.

Myers, James E. 1978. Cahto. In Handbook of North American Indians. Vol. 8, edited by R.F. Heizer, pp. 244–248. Smithsonian Institution, Washington, D.C.

NAHC (Native American Heritage Commission). 2024. Sacred Lands File search and list of regional Native American Tribal representatives and organizations for the Potter Valley Project. Request submitted by Stantec Cultural Resource Specialist Crystal West. Response from NAHC to Stantec dated September 11, 2024.

NAHC. 2018. Sacred Lands File search and list of regional Native American Tribal representatives and organizations for the Potter Valley Project. Request submitted by Pacific Gas and Electric Company (PG&E) Cultural Resource Specialist Ms. Leslie Sakowicz. Response from NAHC to PG&E dated May 21, 2018.

NAHC. 2016. Sacred Lands File search and list of regional Native American Tribal representatives and organizations for the Potter Valley Project. Request submitted by Pacific Gas and Electric Company (PG&E) Cultural Resource Specialist Ms. Leslie Sakowicz. Response from NAHC to PG&E dated October 7, 2016.

National Archives. 2024. Native American Indian Reorganization Act. Available at: www.archives.gov/research/native-americans/indian-reorganization-act. Accessed July 2024.

National Park Service (NPS). 2023. National Register Bulletin 38: guidelines for evaluating and documenting traditional cultural places. Draft for review, November 6, 2023. Available at: ParkPlanning - DRAFT National Register Bulletin: Identifying, Evaluating, and Documenting Traditional Cultural Places dated 2023-11-06 (nps.gov). Accessed February 2, 2024.

Native Ministries International. 2022a. Manchester Band of Pomo Indians of the Manchester Rancheria, California. Available at: https://data.nativemi.org/tribal-directory/Details/manchester-band-of-pomo-indians-of-the-manchester-rancheria-california-198612.

Native Ministries International. 2022b. Potter Valley Tribe, California. Available at: https://data.nativemi.org/tribal-directory/Details/potter-valley-tribe-california-198549.

Pappas, Stephen. 2018. Pre-field analysis and inventory strategy for the PG&E U.S. Forest Service emergency hazard tree and pole replacement and master special use permits--Mendocino National Forest. Report. ICF, Sacramento, California.

Parker, Patricia L. and Thomas F. King. 1998. Guidelines for evaluating and documenting traditional cultural properties. National Register Bulletin 38. Revised. Originally published 1990. U.S. Department of the Interior National Park Service, Interagency Resources Division, Washington, D.C.

Paskenta Band of Nomlaki Indians. 2024. Our History & culture. Available at: History and Culture - Paskenta Band of Nomlaki Indians.

Peabody, Joshua B. 2012. Cultural study: Cape Horn Dam weir E3-A and 3B replacement project, Mendocino County, California. Report. Cardno ENTRIX, Sacramento, California.

PG&E (Pacific Gas and Electric Company). 2017. Potter Valley Hydroelectric Project, FERC Project No. 77, relicensing pre-application document.

Pinoleville Pomo Nation. 2020a. Our history. Available at: https://pinoleville-nsn.gov/heritage/our-history/.

Pinoleville Pomo Nation. 2020b. Recent history. Available at: Recent History – Pinoleville Pomo Nation.

Potter Valley Tribe. 2024. Our projects. Available at: https://pottervalleytribe.com/projects.

Pulikla Tribe of Yurok People. n.d. Who we are. Available at: https://puliklatribe.gov/who-we-are/.

Quartz Valley Indian Community. 2024. Our history. Available at: https://qvir.com/history-of-qvir/.

Redding Rancheria. 2024. State of the tribe address 2024. Available at: https://www.reddingrancheria-nsn.gov/state-of-tribe-address/.

Redwood Valley Little River Band of Pomo Indians. 2024. About Redwood Valley Rancheria. Available at: www.rvrpomo.net.

Robinson Rancheria. 2020. Heritage. Available at: https://rrcbc-nsn.gov/heritage/.

Robinson, W.W. 1948. Land in California: The story of mission lands, ranchos, squatters, mining claims, railroad grants, land scrip, homesteads. University of California Press, Berkeley, Los Angeles, London.

Round Valley Indian Tribes. n.d. Pre-history of Round Valley. Available at: www.rvit.org/about/about-us.

Scotts Valley Band of Pomo Indians. n.d. History. Available at: https://www.scottsvalley-nsn.gov/heritage/history.

Shasta Indian Nation. 2024a. 2,800 Acres of ancestral homelands returned to Shasta Indian Nation. Available at: https://shastaindiannation.org/index.html.

Shasta Indian Nation. 2024b. Our home. Available at: https://shastaindiannation.org/index.html.

Shebelna Band of Mendocino Coast Pomo Indians. n.d. Who we are. Available at: https://shebelna.wordpress.com/about/.

Sherwood Valley Band of Pomo Indians. n.d. Tribal history. Available at: www.sherwoodvalleybandofpomo.com/about-us.

Tolowa Dee Ni' Nation. n.d. About us. Available at: https://www.tolowa-nsn.gov/35/About-Us.

Trinidad Rancheria. 2024a. About. Available at: https://trinidad-rancheria.org/about/.

Trinidad Rancheria. 2024b. Public walkthrough of stormwater construction project at Trinidad Harbor in celebration of World Ocean's Day. Available at: https://trinidad-rancheria.org/wp-content/uploads/2023/06/World-Ocean-Day-Press-Release-Storm-Water-Project-FINAL.pdf.

Tsnungwe Tribe. 2019. Who we are. Available at: https://dannyammon.wixsite.com/website.

UC Law San Francisco. 2024. The Yuki people and the legacy of Serranus Hastings. Available at: https://www.uclawsf.edu/2021/04/23/the-yuki-people-and-the-legacy-of-serranus-hastings/.

United Indian Health Services. 2023. Bear River Band of Rohnerville Rancheria. Available at: https://unitedindianhealthservices.org/consortium-tribes-2/bear-river/.

Winn, Robert. 1986. The Mendocino Indian Reservation. Mendocino Historical Review XII, fall/winter 1986.

Winnemem Wintu Tribe. n.d.a. Who we are. Available at: http://www.winnememwintu.us/who-we-are/.

Winnemem Wintu Tribe. n.d.b. Winnemem Wintu – middle water people. Available at: http://www.winnememwintu.us/.

Wintu Tribe of Northern California. 2024. Wintu Tribe of Northern California. Available at: https://wintutribe.com/.

Wiyot Tribe. n.d.a. Tribe history and our story. Available at: https://www.wiyot.us/.

Wiyot Tribe. n.d.b. Tribe history and our story. Available at: https://www.wiyot.us/361/Our-Story.

Yocha Dehe Wintun Nation. 2024. We are the Yocha Dehe Wintun Nation. Available at: https://yochadehe.gov/.

Yurok Country. 2023. Official website. Available at: https://www.visityurokcountry.com/#:~:text=The%20Yurok%20(Oohl)%20Tribe%20is,MORE%20ABOUT%20THE%20YUROK%20TRIBE.

Yurok Tribe. 2024. Official website. Available at: https://www.yuroktribe.org/.

APPENDIX 3.3.12-A

Tribal Letters Regarding PG&E Initial Draft Surrender Application

This Page Intentionally Left Blank

ROUND VALLEY INDIAN TRIBES

A Sovereign Nation of Confederated Tribes

TRIBAL COUNCIL OFFICE77826
COVELO ROAD
COVELO, CALIFORNIA 95428
PHONE: 707-983-6126
FAX: 707-983-6128

LOCATION: ON STATE HWY 162ONE MILE
NORTH OF COVELO
IN ROUND VALLEY
TRIBAL TERRITORY SINCE TIME BEGAN

December 22, 2023

Via Electronic Submittal

Tony Gigliotti
Senior Licensing Project Manager
Pacific Gas and Electric Company
Power Generation
12840 Bill Clark Way
Auburn, CA 95602
E-mail: PVSurrender@pge.com

Re: Round Valley Indian Tribes' Comments on Initial Draft Surrender Application and Conceptual Decommissioning Plan, Potter Valley Project (FERC P-77)

Dear Mr. Gigliotti:

On behalf of the Round Valley Indian Tribes (RVIT or Tribes), we submit these comments on the Initial Draft Surrender Application and Conceptual Decommissioning Plan (draft Plan) in the above-captioned proceeding.

The Round Valley Indian Tribes are a sovereign confederation of Indian tribes in Northern California that includes the Yuki, Concow Maidu, Little Lake Pomo, Nomlaki, Wailaki and Pit River Tribes. Our culture and history have been tied to the Eel River since time began. The Eel River today remains central to the cultural identity of the Round Valley Indian Tribes; it provides water for fish and farming and is inexorably tied to Tribal traditions and ceremonies. The location of our Reservation reflects the importance of the Eel River to our way of life. The Reservation is bordered by the main stem Eel River on the west, the middle fork on the east and the north fork on the north. The Eel River is the lifeblood of the people of the Round Valley Indian Tribes, and its health is essential for our survival.

The Potter Valley Project (Project) is a short distance from the Round Valley Indian Reservation, and its construction and operation have adversely impacted resources on which the Tribes rely. Since 1908 and the construction of Scott Dam, hundreds of miles of habitat have been cut off from migrating salmon above the dam. For these reasons, the Tribes have important rights and interests at stake in the decommissioning proceeding.

The Tribes are grateful to PG&E's staff for preparing and distributing the draft Plan consistent with the schedule approved by FERC. The Tribes have reviewed the draft Plan with the understanding that this is the first opportunity for public review and comment, and that additional analysis, including critical environmental information, will be included in the Final Draft Surrender Application available in June 2024. Cognizant of the facts that the Plan is in its conceptual stage, and that many details of the Plan are yet to be developed, we take this opportunity to highlight below several areas in which additional data and analyses will be needed to inform the Final Surrender Application and to provide the factual and technical bases for environmental reviews.

We support the overall approach articulated in the conceptual plan, and we look forward to working with PG&E and stakeholders in the coming months to further develop the information necessary to obtain orders from FERC accepting surrender of the license and approving the decommissioning plan. The Tribes appreciate PG&E's commitment to adhere to the schedule approved by FERC. A collaborative approach to developing the facts and analyses in support of license surrender and decommissioning is best suited to meeting the timelines in the schedule. A collaborative approach is also consistent with the Tribes' special role as consultative partners with PG&E under FERC regulations. The Tribes believe that the process to develop this factual and technical predicate should begin soon, and certainly should not wait until the release of the Final Draft Surrender Application scheduled for release in June 2024.

The Tribes support the conceptual approach of PG&E's draft Plan that includes removal of both Scott Dam and Cape Horn Dam with site restoration to pre-Project conditions, and terms and conditions under which PG&E would no longer operate or maintain the Project. Our restoration goal is a free-flowing Eel River and the fishery restored to support naturally reproducing, self-sustaining, and harvestable native anadromous fish populations. Dam removal is a necessary step toward genuine Eel River restoration. Because of the benefits dam removal provides to the Round Valley Tribes community as a whole, including specifically river and fishery restoration, that approach to decommissioning is consistent with the Tribes' federal water and fishing rights, and it promotes the public interest that FERC is obligated to respect. As the original inhabitants of the lands on which the Project was built more than 100 years ago, the Round Valley Indian Tribes' can provide a unique perspective that will help inform terms and conditions on dam removal and Project decommissioning.

As you know, the Tribes joined with the California Department of Fish and Wildlife, California Trout, Humboldt County, Mendocino County Inland Water and Power Commission, Sonoma County Water Agency, and Trout Unlimited (collectively referred to as the Proponents) in a proposal for a new diversion facility in the Cape Horn Dam Area. The Tribes reaffirm our support for the Proponent's proposal. Our specific comments and suggestions on the other sections of the draft Plan are provided below.

Initial Draft Surrender Application and Conceptual Decommissioning Plan

The Tribes acknowledge that including a list of anticipated information needs (studies) is premature for the Initial Draft Surrender Application and Conceptual Decommissioning Plan, but we strongly encourage PG&E to consult with the Tribes and Agencies in the next two months to develop a list of anticipated information needs for the Final Draft Surrender Application to be released in June 2024. We request that this list of anticipated information needs be developed now rather than waiting until the environmental review process for the construction phase because: 1) some of the studies needed to inform both the decommissioning plan and environmental review process will likely require several years to develop and implement, and 2) some of the information will need to address potential impacts that are not directly related to construction activities (e.g., sediment transport and deposition downstream once Scott Dam is removed).

The Initial Draft Surrender Application and Conceptual Decommissioning Plan provides considerable detail on the dam removal process, yet provides no information on how the former inundation zone of Lake Pillsbury and Van Arsdale Reservoir will be restored, nor is any information provided for how the considerable volume of fine and coarse sediments within the inundation zones will be managed as part of the decommissioning plan. The restoration of these areas and how sediment will be managed is critical to the post-decommissioning condition of ecological resources that the Tribes depend upon, and accordingly, the Tribes request that PG&E-planned ecological impact prevention and restoration be included in initial consultation with the Tribes and Agencies, and that a substantial level of detail on these topics be included in the Final Draft Surrender Application.

The Tribes also request that PG&E convene technical workgroups with Tribal and Agency topical experts to discuss key aspects of the Decommissioning Plan, including the dam removal process, sediment management process, river restoration process (engineering/fluvial geomorphology, fisheries, and vegetation issues), invasive species eradication, aquatic species impact mitigation plan, and other topics that may be needed. We request that a list of potential technical workgroups be discussed during the Initial Consultation process with the Tribes in the next two months.

Tribal Resources

The Tribes appreciate the fact that a draft conceptual decommissioning plan need not address each term and condition to be included in the license surrender application to be presented to FERC in January 2025. However, the Tribes wish to highlight now the importance of including terms and conditions that adequately protect, and mitigate any harm to, tribal cultural resources in the deconstruction and decommissioning process. This is a critically important issue for the Tribes, and we look forward to consultations on that issue. The scope of this issue in decommissioning is broader than in relicensing, because the removal of Project facilities may uncover tribal cultural resources not previously known to exist. Special measures should be adopted to account for that eventuality, and to address monitoring, custody and treatment or disposition of such resources. The Tribes are confident that this issue can be addressed in compliance with the National Historic Preservation Act without altering the decommissioning schedule that FERC has approved. The Tribes are eager to work with PG&E, other tribes, and stakeholders to expeditiously develop cultural resource management plans that will enable the schedule to proceed as planned.

To assist with developing that plan, the Tribes suggest that the plan should address, *inter alia,* the following: 1) background information on the Project; 2) identification and description of tribal cultural resources within or connected to the Project, including Traditional Cultural Properties; 3) discussion of the types of effects that may be expected from decommissioning, and the proposed mitigation and management measures; 4) identification of the Area of Potential Effects under the National Historic Preservation Act; 5) provisions for additional surveys and monitoring during and after dam removal and other Project facility removal, and construction of the New Eel River Facility; 6) provisions for treatment of cultural resources inadvertently discovered; 7) provisions for treatment of human remains; 8) implementation procedures for staff training, reporting, and on-going consultations as required; and 9) process for determining eligibility of cultural resources for listing on the National Register of Historic Places.

The Initial Draft Surrender Application and Conceptual Decommissioning Plan states that "[p]otential effects [and] proposed license surrender conditions" will be included in that Draft Final Surrender Application to be distributed to Tribes and others by June 3, 2024. We are committed to working with PG&E to assist in identifying the potential effects of decommissioning on tribal cultural resources, and we propose to include that topic in the consultation PG&E has scheduled for December 2023 to February 2024. The greatest challenge will be to develop sufficient historical, ethnographic, and factual bases on which to make that determination. Given the compressed time schedule, that work should begin now. If there is not time to plan and complete before the final draft plan an ethnographic study of tribal cultural resources affected by the decommissioning of the Project, alternative means must be found to ensure thorough and accurate information is developed on this important issue.

FERC Environmental Justice Policy

As you know, FERC has developed and issued an Equity Action Plan, to remove barriers for underserved communities and to incorporate equity and environmental justice into the Commission's operations. *See* Equity Action Plan, Federal Energy Regulatory Commission. FERC defines environmental justice as "the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." *See* Environmental Justice, Federal Regulatory Commission. Action 2 in FERC's Equity Action Plan is to advance environmental justice through strengthening tribal government consultation and engagement. Furthermore, a key component of the Commission's effort to advance environmental justice principles is focused on identifying, addressing, and minimizing adverse impacts associated with hydroelectric projects subject to FERC jurisdiction. *See* FERC Roundtable Discussion on Environmental Justice and Equity in Infrastructure Permitting.

For over a century, PG&E has operated the Potter Valley Project pursuant to a license issued by FERC. The diversion of large quantities of water from the Eel

River and the destruction of hundreds of miles of fishery habitat are major factors in the decline of the Eel River and the Coho salmon, chinook salmon, and steelhead trout it supports. We have experienced firsthand the devastating effects on the health of the Eel River and its fisheries, particularly the adverse impact on salmonid populations. Consistent with FERC's goal of promoting equitable treatment of environmental justice communities, including Indian Tribes, PG&E should engage in more collaborative partnerships with Indian Tribes, including the Round Valley Indian Tribes, to formulate a draft Plan that ensures the Eel River does not face further degradation and decline, and is set on a path to restoration.

Tribal Consultation

We understand that, beginning in December 2023 through February 2024, PG&E intends to consult with Resources Agencies and Tribes on further developing and refining the draft Plan. As you know, FERC regulations acknowledge and reinforce the importance of consultation with Indian Tribes in Commission proceedings. *See generally* 18 CFR Part 2. The regulations confirm that consultation must include "direct contact" and "recognize the status of the tribes as governmental sovereigns." 18 CFR 2.1c(a). Furthermore, the regulations mandate that, before a potential applicant files an application to surrender a project, the applicant must consult with any Indian tribe that may be affected by the Project. 18 CFR § 16.8(a)(1). The Tribes are eager to consult with PG&E on the draft Plan and look forward to discussing as soon as possible how PG&E plans to conduct the consultation process beginning this month.

The Round Valley Indian Tribes appreciate the opportunity to provide these comments on the draft Plan, and look forward to discussing these issues in consultation with PG&E.

Sincerely yours,

/s/

Lewis Whipple
Tribal Council President

December 22, 2023

Tony Gigliotti
Senior Licensing Project Manager
Power Generation
12840 Bill Clark Way
Auburn, CA 95602

Submitted via e-mail to: PVSurrender@pge.com

RE: PG&E Potter Valley Hydroelectric Project (FERC Project No. 77)

Initial Draft Surrender Application and Conceptual Decommissioning Plan

Tsinta Ma, (Northern Pomo Greetings)

My name is Nikcole Whipple and I am a member of the Round Valley Indian Tribes. My tribes include the Yuki and Little Lake Pomo, both aboriginal Eel River Tribes. I am writing to support the removal of the Potter Valley Project and to ask PG&E to respect the Trust Responsibility of the Tribes honoring past and current executive orders from State and Federal Officials, to be inclusive of Tribal Beneficial Uses (TBU) and Acknowledge the current and proposed diversion of water is an Unreasonable Use.

Restorative justice and repatriation to the Round Valley Indian Tribes must be a prioritized. Please acknowledge our Senior Tribal Water Right and California Assembly Bill 1936, as this decommissions process takes place.

The Potter Valley Project is located on the ancestral territories of the Yuki and Pomo Tribes. With respect to these two identified tribes, several bands and or tribelets exist, all with distinct documented village sites, languages and ancestral hunting, fishing and gathering sites or beneficial uses. In addition to the Yuki and Pomo, is the Wailaki tribe. The Round Valley Indian Tribes is the only tribe along the Eel River where the (7) distinct Yuki Triblets and Wailaki Tribes are federally recognized.

The Round Valley Indian Tribes is 1 of 5 California reservations established by the United States by Executive Order in 1852. The Nome Cult Farm, is an administrative extension of the Nome Lackee Reservation, where six tribes were force relocated into aboriginal Yuki territories. Today the ancestral territories of the seven confederated tribes of RVIT, roughly 5,600 federally recognized members, span from the border of California and Nevada to the Pacific Coast over multiple water basins including the Eel River.

The (7) Confederated Tribes of the Round Valley Indian Tribes Reservation have not relinquished the right to our ancestral lands, we have not relinquished the right to our water rights, nor have we relinquished our hunting, fishing and gathering rights in our ancestral and or aboriginal territories.

California Assembly Bill No. 1936, Chapter 478

On September 23, 2022, The People of the State of California enacted, AB 1936, Section 1. which exerts; The Legislature finds and declares founder, S.C. Hastings, perpetrated genocidal acts against Native California Indigenous Peoples, specifically the Yuki Tribe, in the 1850s in the Eden Valley and Round Valley Areas in the County of Mendocino;

(q) S.C. Hasting, promoted and financed Native American hunt expedition in the Eden and Round Valleys', funding bounties resulting in the massacre of hundreds of Yuki women and Children

(r)S.C. Hastings enriched himself through the illegal seizure of large parts of these lands and financed the College

(s) S.C. Hastings and the state bear significant responsibility for the irreparable harm caused to the Yuki People and the Native American people of the State

(t) The state has formally apologized to the Native American people of the state for the genocide financed and perpetrated by the state.

Twenty-One Initiatives are included in AB 1936 to atone for the criminal acts of genocide and murder and illegal land forfeiture against the Round Valley Yuki Tribes. Repatriation and reparation are both included, and Yuki Sites are documented along the extent of the Eel River including two desecrated sites under the Lake Pillsbury dam.

In addition to this landmark assembly bill our California Governor has passed the following executive order establishing the significant need to respect our Indigenous Culture, and horrendous history of attempted genocide.

Executive Order N-15-19

Acknowledges and apologizing on behalf of the State for the historical violence, exploitation, dispossession and attempted destruction of tribal communities.

Executive Order B-10-11

It is the policy of the state administration that every state agency and department subject to executive control is to encourage communication and consultation with California Native American tribes.

Executive Order N-82-20

Addressing biodiversity crisis accelerating nature-based solutions requires inclusive partnerships and collaboration among federal, state and local governments and California Native American tribes.

Our California Fish & Game Code acknowledges the Covelo Indian Community in the following sections;

§ 16000. Legislative findings and declarations

The Legislature finds:

(a) Jurisdiction over the protection and development of natural resources, especially the fish resource, is of great importance to both the State of California and California Indian tribes.

(b) To California Indian tribes, control over their minerals, lands, water, wildlife, and other resources is crucial to their economic self–sufficiency and the preservation of their heritage. On the other hand, the State of California is concerned about protecting and developing its resources; protecting, restoring, and developing its commercial and recreational salmon fisheries; ensuring public access to its waterways; and protecting the environment within its borders.

§ 16002. "Covelo Indian Community" "Covelo Indian Community" means the confederated tribes of the Round Valley Indian Reservation located in Mendocino County, California, recognized as an Indian tribe by the Secretary of the Interior

§ 16004. "Traditional Indian fishing practice" "Traditional Indian fishing practice" means a mode, method, or way of taking fish that is recognized in the customs and traditions of the Covelo Indian Community.

§ 16005. "Historic 1873 Round Valley Indian Reservation" "Historic 1873 Round Valley Indian Reservation" means the reservation described and set aside by Congress for the Covelo Indian Community in the Act of March 3, 1873 (17 Stat. 633).

California Fish & Game identify The Round Valley Indian Tribes jurisdictional as River to River, using the Eel River as a regulatory boundary.

California Public Utilities Commission (CPUC) whom regulates essential utility services to consumers, safeguards the environment, assuring safe and reliable access to all Californians. CPUC created the Environmental and Social Justice (ESJ) Action Plan to serve as a commitment to furthering ESJ principles, an operating framework to integrate the agency work. Serving all Californians effectively, CPU must acknowledge that some populations in California face higher barriers to access to clean, safe, and affordable utility services, this includes Federally Recognized Tribes and the areas adjacent to them.

These are just a few of the endless contributions our state and agencies have attributed in an attempt to correct the history our tribal people have endured. Our current climate crisis solutions explicitly provide direction in restoring and accepting tribal management practices. To include Tribal Ecological Knowledge (TEK).

Senior Water Rights Equal Tribal Water Rights

The 1852 Congressional Act creating the Round Valley Indian Community, known today as Round Valley Indian Tribes, pre-dates any other water right, when establishing First In Right, First In Time.

Donnelly v. US, 228 US 243 SC 1913 provides, Congress itself recognized the Hoopa Valley Reservation as lawfully existing, at least as early as July 27, 1868 (15 Stat. 198, 221, c. 248), when it appropriated money "to pay the settlers of Hoopa Valley for their personal property left upon the Hoopa Valley Reservation at the time the Government took possession;" and also "for removing the Indians from Smith's River Reservation to Hoopa Valley and Round Valley Reservations .. . and the Smith River Reservation is hereby discontinued;" and again, in the following year, (act of April 10, 1869, 16 Stat. 13, 37, c. 16), when it appropriated money for the pay of a miller upon the Hoopa Valley Reservation, and "to supply a deficiency for removing the Indians from Smith's River Reservation to Hoopa Valley and Round Valley Reservations."

This case provides historic legal precedence that the Supreme Court Acknowledges the Round Valley Indian Tribes territories.

Covelo Indian Community v. FERC, 895 F.2d 581, states the underlying premise is that congressional intent will control. *DeCoteau v. District County Court, supra,* [420 U.S.] at 444, 449, [95 S.Ct., at 1092, 1095]; *United States v. Celestine,* 215 U.S. 278, 285, [30 S.Ct. 93, 94, 54 L.Ed. 195] (1909). In determining this intent, we are cautioned to follow "the general rule that `[d]oubtful expressions are to be resolved in favor of the weak and defenseless people who are the wards of the nation, dependent upon its protection and good faith.'" *McClanahan v. Arizona State Tax Comm'n,* 411 U.S. 164, 174 [, 93 S.Ct. 1257, 1263, 36 L.Ed.2d 129] (1973), *quoting* *Carpenter v. Shaw,* 280 U.S. 363, 367, [50 S.Ct. 121, 122, 74 L.Ed. 478] (1930); *see also* *Mattz v. Arnett, supra,* [412 U.S.] at 505, [93 S.Ct., at 2258]. The mere fact that a reservation has been opened to settlement does not necessarily mean that the opened area has lost its reservation status.

The case exerts, as an agency of the federal government, FERC is subject to the United States' fiduciary responsibilities towards Indian tribes. *See* *Nance v. EPA,* 645 F.2d 701, 711 (9th Cir.), *cert. denied,* 454 U.S. 1081, 102 S.Ct. 635, 70 L.Ed.2d 615 (1981). The same trust principles that govern private fiduciaries determine the scope of FERC's obligations to the Community. *See* *Assiniboine and Sioux Tribes v. Board of Oil and Gas Conservation,* 792 F.2d 782, 794 (9th Cir.1986). The Community, known today as the Round Valley Indian Tribes, by virtue of being located on the Round Valley Indian Reservation, has statutory fishing rights in the Eel River. *See* 17 Stat. 633 (1873). ***This should sufficiently establish the Community's property right for purposes of due process analysis.***

In Winters, the Supreme Court examined tribal rights to water associated with the Fort Belknap Reservation located in what would later become Montana. The Fort Belknap Reservation was created by an agreement in 1888 between tribal parties and the U.S. government. At the time, the government had a policy seeking to transform Native Americans from "a nomadic and uncivilized people … to become a pastoral and civilized people" by providing them lands to develop for such purposes.

The Winters Doctrine held, federally reserved lands have a right to use sufficient water to fulfill the "primary purpose" of the reservation, claiming; *Tribal Water Rights Cannot Be Destroyed by State Water Law or By Water Users Acting in Accordance with State Law*

Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Water

Order No. 3403, Amendment 1. Issued by the Secretary of Agriculture, the Secretary of the Interior and the Secretary of Commerce (Secretaries) to ensure that the Department of Agriculture, the Department of the Interior, and the Department of Commerce (Departments) and their component Bureaus and Offices are managing Federal lands and waters in a manner that seeks to protect the treaty, religious, subsistence, and cultural interests of federally recognized Indian Tribes consistent with the nation-to-nation relationship between the United States and federally recognized Indian Tribes; and, that such management fulfills the United States' unique trust obligation to federally recognized Indian Tribes and their citizens.

In conclusion, I thank you for your time to provide my comment and ask that all of the laws, case finding, and regulations that our nation, states and officials have worked so diligently to create to atone for the history of our first nations. The United States federal government exercised its greatest power over tribal nations through the Major Crimes Act, 18 U.S.C. §1153 (1886), reviewed for constitutionality in *United States v. Kagama*, 118 U.S. 375 (1886), where the Supreme Court held Congressional Plenary Power over Indian affairs is, extra-constitutional, not grounded in the text of the Constitution, holding the national government is not one of limited enumerated powers. With these enumerated powers in mind we ask you to honor Joint Secretarial Order No. 3403, Amendment No. 1, in fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters.

Kedi Wadum, (Northern Pomo, Walk Well)

Nikcole Whipple

Round Valley Indian Tribes, Tribal Member

Roll Number 80-51

POTTER VALLEY TRIBE

2251 S. State St. ● Ukiah, California 95482 ● (707) 462-1213 ● Fax (707) 462-1240
● E-mail: pottervalleytribe@pottervalleytribe.com

Chairperson
Salvador Rosales

Secretary
Rosemary Rahmaoui

Treasurer
Losario Rosales

December 22, 2023

VIA Email: PVSurrender@pge.com
Gigliotti, Tony <T1GF@pge.com>
Tony Gigliotti
Senior Licensing Project Manager
Power Generation
12840 Bill Clark Way
Auburn, CA 95602

Re: Initial Draft Surrender Application and Conceptual Decommissioning Plan

I am writing this letter on behalf of the Potter Valley Tribe, which is composed of Pomo people who have occupied the area of Mendocino County for ca. 10,000 years prior to the arrival of non-Indian settlers. Despite the significant historical connection between the Tribe and the lands involved in the Initial Draft Surrender Application and Conceptual Decommissioning Plan ("Plan"), we have not been afforded any prior consultation during any FERC proceeding on the Potter Valley Project. We were provided with the Initial Draft Surrender Application, via email link, but no other communication of which we are aware.

We are the Tribe with the closest aboriginal and cultural ties to the land and water that are impacted by the Plan, however, there has been no meaningful outreach, information sharing or an opportunity to consult with PG&E on this, or any other aspect of the Plan. This letter contains the basis for our continued request for the restoration of the lands impacted by the Plan, particularly the land that PG&E retained during the Stewardship Council process.

While the Tribe did benefit from a donation of land from PG&E during the Stewardship Council process, the Tribe has continued to seek the return of the balance of the property retained by PG&E. Now that PG&E seeks to decommission the projects that were retained based on an assertion that they could not be transferred because they were subject to a FERC license, the Tribe again seeks the return of our aboriginal lands, which were taken by what would be considered unlawful means today.

Our primary comment to the Plan decommissioning plan is that it does not address disposition of the land PG&E retained that was not identified as within the FERC project boundaries. The interplay between the Stewardship Council process and this Plan, in conjunction with the California Public Utilities Commission's Tribal Land Return Policy, requires this Plan to be specifically discussed with the Potter Valley Tribe, not just with an email - we need to meet in person with PG&E to discuss the impact of the Plan on the Tribe and its adjacent land.

As far as the diversion, we agree with Alternative C2 – Roughened Channel with Gravity Supply at this point. This would allow a natural flow of the Eel with gravity feed to Russian watershed. However, we want to wait until the studies on the alternatives are out before taking a final position on the best alternative.

We also want to take this opportunity to educate PG&E on the history of the land in question, which provides the basis for our perspective on the Plan. Please review this material, because it is essential to understand the history of the land to understand the reasons for the Tribe's concerns and desire to have the land returned to the Tribe. We understand that much of this material will be new to PG&E, and perhaps some might find it irrelevant. However, from the perspective of the Potter Valley Tribe, the history of the land, and its use, is key to understanding the Tribe and its ties to the land.

I. Historical Background – How the Tribe's Lands Were Taken by Predecessors of PG&E with No Compensation

It was not until the beginning of the Nineteenth Century that the American, Russian, Spanish, and English quest for sea-otter brought frequent visits of non-Indians to Mendocino County. The rapid influx of the coastal otter hunters had a profound effect on the coastal Indians. Initially, regular contact between the Potter Valley Pomo with Euro-American peoples occurred while away on collection trips at Point Arena and the Fort Bragg area; however, the effect was soon felt inland in the region of Potter Valley.

In the late 1840's there were thousands of Indians living in Mendocino County. The lands were bountiful with the best salmon fishing rivers in the State, huge quantities of acorns, and lush verdant valleys of clover and grasses so tall that deer and pronghorn could hide in it. The abundance of natural resources and food producing areas sustained the Indian population and drew the first settlers to the region desiring to raise cattle, horses, and hogs. Unfortunately, problems quickly developed between new settlers and local Indians involving a struggle for territory and competition over food between livestock and people.

As a result of these tensions, a pattern of conflict developed. Settlers began forcing Indians from their land along the river plains into the mountains. In the mountain areas natural food resources were seasonally sparse and less reliable than within the valley zones. Soon Indians struggled to feed themselves. Thus, Indians would steal livestock from the settler's farms to ward off starvation. In return, angry settlers retaliated by hunting down the Indians and murdering them. The killing of Native people in Mendocino is well-documented.

By the spring of 1855, cold weather, a lack of food in the mountains, and a failed acorn crop drove Indians from the interior mountains to the coast to procure shellfish and seaweed.[1] However, problems continued as food became scarce. The situation intensified until May 1, 1855 when 51 settlers on the Mendocino coast wrote a petition demanding that the government take action to resolve the "Indian problem". The strongly worded petition stated in no uncertain words that if the government did not act immediately "a war of extermination"…will… "be entered into, by a set of men, maddened by the losses of several years labor."[2] It was not long thereafter that two large Indian Reservations were established in Mendocino County.

The Mendocino Reservation- Removal of Indians to "Clear" the Land for Settlers

In 1853, a system of Indian Reservations was set up throughout California to segregate Indians for their protection from settlers and to free Indian lands for settlement.[3] Originally the $275,000 federally appropriated budget was for the purpose of "collecting, removing, and subsisting the Indians of California."[4] However, in the spring of 1855, Thomas J. Henley, Superintendent of Indian Affairs in California managed to get funding to create three additional California reservations, circumventing the 1853 legislation, which had limited the number of reservations in California to five. Through establishing reservations, Henley proposed to "finally rid the State of this class of population."[5] Toward this end, two reservations were established in Mendocino County: The Mendocino Reservation, on the coast, and the Nome Cult Farm in Round Valley. The 25,000-acre Mendocino Reservation was located between the Noyo and Ten Mile Rivers on the site of present day Fort Bragg. By July 1856, hundreds of Indians - Pomo, Yuki, and others from as far away as Eureka and Chico- were force marched to the Mendocino Reservation.

The Mendocino War- State Funded Genocide

The period between 1856 and 1860, termed the "Mendocino War," marks some of the most intense violence perpetrated by settlers on the Indian tribes. During this period the social and political organization of the Mendocino Indians was utterly destroyed and the majority of Indians in the area were either murdered or scattered.[6] Following the establishment of the Mendocino Reservation and the Nome Cult Farm in 1856, the first settlers began arriving in Mendocino County. Settlers, including some agents of the Office of Indian Affairs, wished to develop the valuable agricultural

---

[1] White 1855.
[2] Hoopes 1932:59.
[3] Robert Winn's "The Mendocino Indian Reservation" provides a very detailed and accurate account of the reservation system in Mendocino County. The following section is an abbreviated account from his work on the subject.
[4] Henley 1856:239
[5] 1856:239
[6] Special Joint Committee 1860

potential of the valley and viewed the reservations and its Indian population as a problem. Among these was Superintendent Henley, who acquired extensive land holdings in Round Valley. Fortunately, other agents working with the Office of Indian Affairs at the Nome Cult Farm had more honorable purposes and wished to protect the Indians from the violence of local settlers. However honorable their intentions, they were unable to protect the Indians from the settler attacks.

Hostilities in the region commenced as soon as settlers arrived in 1856. Forced to the brink of starvation, the cycle continued as Indians stole food and slaughtered livestock from settler's farms. Settlers became angered, organized, and went on elaborate expeditions to murder Indian groups. Bloodshed became a frequent occurrence as settlers massacred Indian groups in an attempt to completely eliminate the Indians from Round Valley.

Dryden Lacock was one of the early ranchers in Round Valley and a former employee of the Nome Cult Farm. In testimony given at the Special Joint Committee investigation on the Mendocino War, Lacock stated, "In 1856, the first expedition by the whites against the Indians was made and have continued ever since. These expeditions were formed by gathering together a few white men whenever the Indians committed depredations on their stock. There were so many expeditions that I cannot recollect the number. The result was that we would kill, on the average, 50 or 60 Indians on a trip, and take some prisoners, which we always took to the reserve."[7]

The war of extermination continued to escalate until the U.S. Army temporally assigned troops to Cape Mendocino in 1857 under Lieutenant Gibson, who established and built Fort Bragg three miles north of the reservation. Two years later, permanent troops were established on the Mendocino Reservation. About the same time Major Edward Johnson and Lieutenant Edward Dillon brought 20 enlisted men to the Nome Cult Farm in Round Valley to protect the Indians from extermination. Major Johnson threatened to arrest local ranchers who were found guilty of killing Indians. However, the presence of the Army had little effect on the mobs who continued to hunt and murder Indians in great number. In one instance, Indians were reported to have killed three cows and a fine stallion owned by Mr. Hall of Eden Valley. Lieutenant Dillon agreed to search out the Indians and bring them back to the reservation provided the settlers did not retaliate against the Indians. Dillon attempted to search out the guilty Indians but returned unsuccessful a few days later. Sometime later Dillon learned that Hall had taken a large party of settlers out along the Eel River where they hunted Indians for two weeks, during which time they had killed 240 Natives.

Antagonism between the army officers and the settlers increased as Indian massacres continued. Serranus Clinton Hastings, the first Chief Justice of the California Supreme Court and retired California Attorney General, owned most of Eden Valley northeast of Little Lake Valley. Superintendent Henley owned the remainder of Eden Valley. Together, these two prominent stock raisers conspired to form a militia company to protect the Mendocino residents from hostile savages who were allegedly attacking settlers "on sight" and had already destroyed $40,000 worth of private property. In a petition to the State Legislature signed by Henley and 28 settlers, Hasting recommend Walter R. Jarboe as militia commander. Jarboe was well known for his hatred of Indians and was rumored to have led the massacre of 60 Indians on the Mendocino Reservation the previous year.[8] By July 1859, the settlers maintained a private standing army under the direction of Captain Jarboe and came to be known as the Eel River Rangers.[9] On September 16, 1859, California Governor John

[7] Tassin 1887:55
[8] Hastings 1859
[9] Jarbow 1859

B. Weller agreed to fund the private militia of Rangers on commission, giving legal sanction for Jarboe and his men to continue their killing.

With the public sanction, the Eel River Rangers immediately embarked on a campaign of murder. Although the Governor had voiced alarm at the killing of women and children, and newspapers took up the plight in support of the unfortunate Indians, killing by the Eel River Rangers continued. Although Jarboe and his Eel River Rangers were occupied with almost daily attacks against the Indians, Mendocino County settlers grew impatient with the progress. Therefore, they organized a private company of 40 men under Captain Farley and set out to hunt Indians. Farley stated that in the course of 22 days "I think we killed one hundred and fifty or two hundred Indians. We have taken 22 prisoners, who I sent to the Mendocino Reserve."[10]

Death or threat of death became a common experience of all Native American inhabitants of Mendocino County. It is impossible to ascertain exactly the number killed by the Eel River Rangers during its five months of operations. In an official letter from Jarboe to Governor John B. Doweny in February of 1860, Captain Jarboe claimed "238 warriors killed, the number wounded not known, took 292 prisoners, sent then to the reservations."[11] This letter served as an invoice to the governor for services rendered, charging the State government $11,143.43 for the five-month period. For Captain Jarboe, the Eel River Rangers had been a very profitable venture.

During the Mendocino War, approximately 1040 head of cattle were reported stolen by Indians. In retaliation for these thefts, 769 Indians, most of them Yuki, were slain near Round Valley. During this same period just eight settlers were reported slain by Indians. Although investigations conducted in Round Valley 1860 by a Special Joint Committee of the California State Legislature were alleged to have concluded the violence, it continued for many years thereafter.

California's early policy toward Indians was obvious. The State government was openly hostile to the Indians of California and participated in their destruction; beginning in 1859 with Governor Weller's public funding of the Eel River Rangers, to the 1860 bill essentially rendering Indians as indentured servants to the settlers.[12] Federal policy toward Indians was mixed. In 1850, Congress appointed three commissioners to obtain information about and negotiate treaties with California tribes. For a year, they traveled throughout most of the State, and negotiated 18 treaties, creating reservations, promising federal aid for such things as education and farming, and guaranteed traditional hunting and fishing rights in exchange for the land the Indians were currently possessing. Because of strong pressure from the State, the United States Senate refused to ratify the treaties.

This news did not get back to the Indians until 1928 when they were first provided some compensation for the 1851 value of the lands that were to be set aside as reservations. They were never fully compensated for the lands they agreed and had surrendered under the "treaties." A lawsuit followed, and in 1944, the tribes were awarded $17,053,941. After the government deducted expenditures of $12,029,099, the net amount awarded was $5,024,842 and Indians received payments of $150 each.[13]

---

[10] Jarboe 1859
[11] Jarboe 1859
[12] California Statues 1860: An Act for the Government and Protection of Indians, which allowed the arrest of Indians, including children, who were found to be vagrant, and allowed their hiring out through any local justice of peace, effectively arranging for the sale of Indians into slavery. This same Act prohibited the conviction of any white man for an offense upon the testimony of an Indian. In 1860, the Act was amended to condone the kidnapping and sale of Indians not already indentured. This act was repealed in 1863 (CA Indian History), but much damage had already been done.
[13] Indian Tribal Cases decided in the Court of Claims of The United States Briefed and compiled to June 30, 1947, Vol. 1, RG 123, NARA

Unfortunately, the attitude of military agents and the Office of Indian Affairs toward Indians also contributed to Indian deterioration. In 1859, T. J. Henley was relieved of his position as Superintendent of Indian Affairs for mismanagement of funds and fraudulent practices with the federal reservation system. Theft of reservation federal money for private ventures had become so common that the Secretary of the Interior reduced the annual allotment to reservation system in California from several hundred thousand dollars to $50,000. Administration of the reservations was appalling; Indians were starving, infected with diseases, abused and murdered within the confines of the reserves. Often the reservation officials were members of private groups that hunted Indians, killing many, and taking survivors to reservations.

By 1859 the reservations had fallen to such decay that they were no better than concentration camps. Population of the reservations had been reduced to no more than two or three hundred Indians on each reserve.[14] Starvation, disease, gunshot wounds, hangings, or other violent means had killed approximately 150,000 Native people. As a result of mismanagement and an infusion of settlers, in 16 short years between 1849 and 1865, California's Native Indian population had been lowered from an estimated 175,000 to 20,000.[15]

The Homestead Act of 1862 furthered the Indians impoverished condition by entitling and enabling all adult male citizens to claim 160 acres of any land as long as they physically possessed the land and filed the appropriate claim. During the 1850's and 1860's, the land the Native peoples had lived on for thousands of years became completely taken over by new settlers through this process. While beneficial for the new settlers, native peoples could not claim the land they already lived on since they were not granted legal U.S. "citizen" status until 1924.[16]

While new settlers established homesteads across Northern California, the new settlers also began developing the local timber industry. In turn, costal land and harbors became valuable assets, forcing the Mendocino Reservation to be discontinued in 1867, so the Reservation land could be utilized for these purposes. Indians were again forced to move, seek homes with relatives, adapt to the new culture, or die of starvation, exposure, or outright murder.[17] Many Indians began to work for ranchers: men tended livestock and fields while women did domestic chores.

The Bloody Run

In 1871, several citizens of Potter Valley petitioned for removal of Indians from their neighborhood.[18] Indians working on rancherias were mercilessly marched to the Round Valley Reservation in 1870-71. Those who resisted or could not keep up were killed and the Eel River ran red with blood, from which came the name "Bloody Run." After some years at the Round Valley Reservation, many of the Potter Valley Pomo people decided to return home.

Beginnings of the Potter Valley Rancheria

In 1879, one group of Pomo Indians bought land near Ukiah, which later became known as Pinoleville. Others lived where they could in Potter Valley, along the Eel River, or in other areas, many provided for by the ranchers for whom they worked. Forced to play by the new settlers' rules,

---

[14] Cook 1956:22
[15] Cook 1956:15
[16] Bell
[17] Bell, 1988
[18] Crevelli 1955:96

in 1885, 14-18 families of the surviving Potter Valley Indians purchased land from a local rancher. By 1892, fourteen Indians paid their portion in full ($10 in gold coin) and acquired title to this 10-acre parcel of land on present day Spring Valley Road, in Potter Valley, California. According to early ethnographers, most of the remaining Potter Valley Indians were living on this land, with about 50 people in 11 houses.[19] A small school sat on the site along with an ancestral tribal cemetery located up the hill to the south of the land. The cemetery contains many unmarked and marked grave sites, including one of the original landowners and tribal leaders, Tony Metock.[20]

On this land, they built modest houses, dug wells for drinking water, and had no electricity, despite the fact that their lands and water had been taken to develop power generation for settlers. There was not enough room for field crops on the land, just enough for their own gardens. As the land would not support them, most Indian families worked for the ranchers and migrated to follow seasonal work in the hops fields, pear orchards, and bean fields, shearing sheep, cutting wood, or hauling freight.[21] The whole family worked and this pattern took them away from their homes from spring to fall with breaks to harvest their traditional foods and materials on the coast and in the hills.

Around 1900, native children attended a small school on this land, operated by the Methodist Episcopal Church. In December 1909, the BIA hired a teacher to open a day school in the Church schoolhouse. About 10 children attended during the winter months and in the spring of 1910, the school was closed because of poor attendance. Year after year Native families tried to place their children in local public schools but either did not have the funds or faced opposition by prejudiced Trustees to do so. In 1916, the BIA decided to reopen the school. The school ran for two more years, but the same difficulties arose. When parents went away for work, attendance dropped from 16 to 2, and the school was closed for the last time in 1919. Eventually, however, Indian students were accepted into the Potter Valley School; the students considered it a great honor.

Adding to the Tribe's newfound place of refuge was a newfound economic change. Pomo baskets began to be bought and sold, first by local collectors, and later became much sought after by collectors from outside the area and eventually museums.[22] Women thus became significant wage earners, gaining prestige among whites and their own people.[23]

In 1905, the government's mistreatment of Native Californians, especially with regard to the government's failure to sign the treaties, finally came to light after U.S. Senate files were opened documenting the mistreatment. To rectify such conduct, the 1906 Congress appropriated funds to buy land and develop water for Indians. In 1909 the Bureau of Indian Affairs bought an additional 16 acres of land just north of and adjacent to the 10-acre property and established the Potter Valley Rancheria. Later, two 40-acre parcels were withdrawn from public domain land by Departmental Order on June 16, 1909 to provide a woodlot. This land was at the northwestern side of Potter Valley in the hills, about five miles from the original land. The Tribe became aware of the land in 1913, but the road was not passable in winter because the creek rose too high, and they were not clear about the boundaries, thus this land was not used much. These two properties are still located on topographic maps, depicted as belonging to the Potter Valley Rancheria. Later, according to a BIA timber trespass report, the timber was harvested and removed, leaving only harvestable firewood.

---

[19] ASI, 2003
[20] Barrett 1933.
[21] Patterson 1998: 12
[22] Smith-Ferri 1998
[23] Patterson 1998: 13

Life on the Rancheria[24]

Even though the U.S. Government had bought a parcel of land for the Potter Valley Indians, it did little else to help them adjust to the destruction of their traditional way of life. The Indians originally lived in a harmonic relationship with their environment. Although they managed their resources through selective harvesting, burning, and low technology tools, they were not as adept at manipulating the environment as the new settlers. Cultivation, agriculture, and animal husbandry produced social and economic gains far beyond the capabilities of Indian cultures.

Several attempts were made during the 1920's to allot land to individual tribal families, initiate farming practices and irrigation, and teach the Indians the European/American ways. Evidently this did not come to pass because local ranchers and farmers, seeing vacant land, inquired about using it. The BIA rented parts of the Rancheria out for agricultural use during 1920-1940. The best the Pomos could achieve was a sustenance existence from the sale of some of their firewood, arts and crafts (baskets).

In 1926 the Potter Valley Irrigation District formed and constructed two lateral canals supplying Eel River water (diverted through a tunnel in 1908 for power production) to the valley. The west canal flowed adjacent to the Potter Valley Rancheria and through the southwest corner of the original 10-acre parcel. The water rights granted to the Rancheria at the time of construction of the canal, according to BIA records, were sold by one of the families in the 1960s. Presently, there is a moratorium on new water withdrawals from the district, and the amount of water available in the near future will likely be reduced for all users.[25] There is little likelihood that the Tribe will be able to use the irrigation canal that crosses this land.

Termination of the Potter Valley Rancheria

In 1958, Congress passed the first "Rancheria Act", and 41 Rancherias in California were terminated. Among these--in addition to Potter Valley--were Guidiville, Pinoleville, and Redwood Valley. Throughout California, 7601 acres of trust lands were terminated, along with 1,330 Native people. The Potter Valley Rancheria was formally terminated on August 1, 1961. This revoked the Tribe's federal status, excluded members from further federal assistance as Indians, and distributed land assignments to eligible members. This placed the land in fee simple status, allowing members to live on or dispose of the property – and be subject to State property taxes for the first time in history. The 10 acres purchased in 1892 continued to be occupied by Potter Valley Pomo Indians and their descendants; however, the bulk of the Rancheria property was sold over the years, leaving just one or two properties belonging to the heirs of Potter Valley Pomo Indians. This Rancheria, and the 40-ac woodlot, are still erroneously depicted on modern maps

Restoration of the Potter Valley Tribe

In 1924, Congress granted U.S. citizenship to all Native people. Citizenship gave the right to vote, but just as importantly, the right to sue the government. There was growing awareness that Native Californians had not been dealt with fairly by the U.S. In 1979, tribes throughout northern

[24] Bell, 1988
[25] UDJ, 2007

California counties sued in the United States District Court. The lawsuit alleged that the Federal government had illegally terminated plaintiffs, various individuals and 17 Indian tribes. In 1983, Judge Spencer Williams entered a Stipulation for Entry of Judgment that restored and confirmed the status of the individual plaintiffs and the seventeen tribes listed as class members in the lawsuit. This lawsuit, Tillie Hardwick, et. al. v. United States, U.S. Dist. Court, Northern Dist. of California, No. C-79-1710-SW, has become noteworthy in northern California. The Potter Valley Tribe, and others, are often referred to as "Tillie Hardwick Tribes".

On March 2, 1993 the Potter Valley Rancheria adopted a constitution and by-laws, establishing a Tribal Council and assuming governmental functions. In 1999 the Tribe applied for and was awarded its first General Assistance Program (GAP) grant from the U.S. Environmental Protection Agency (EPA). For the first time, the Tribe had an environmental office to provide representation and program development, including usage of funds from the Department of Housing and Urban Development to purchase land for tribal housing. After considering several parcels in Potter Valley, the Tribe purchased their first land for housing in Redwood Valley in 2003.

In 2004, the Tribe reorganized under the name Potter Valley Tribe, and revised the constitution, which was approved by the Department of Interior on September 8, 2004. During this reorganization period, economic development of many of the surrounding Pomo Tribes surpassed any progress or perceived potential for the Potter Valley Tribe, thus many members of the Potter Valley Indian Tribe applied for, and were accepted for membership by other local Tribes, including Sherwood Valley, Robinson, and Pinoleville Rancherias because of their assumed economic potential while the Potter Valley Tribe lost valuable members to their community.

In 2005 the Potter Valley Tribe purchased and rebuilt a community center in Ukiah. In 2006 the Tribe purchased 5.6 acres in the town of Potter Valley and the land is now held in trust for the Tribe. In 2022, the Tribe quieted title to the original 10-acre parcel in Potter Valley and it is now in the Tribe's name and under its protection. The Potter Valley Tribe is slowly growing and planning to acquire property for future generations.[26]

Donative Lands from PG&E

In 2003, the California Public Utilities Commission ("CPUC") approved a bankruptcy settlement agreement regarding PG&E's 2001 bankruptcy filing. The agreement provided for the environmental benefits and conservation of lands that are important to maintaining the quality of life of all Californians. This included approximately 140,000 acres of PG&E's watershed lands associated with its hydroelectric system.

As part of the settlement, PG&E formed the nonprofit foundation, the Pacific Forest and Watersheds Lands Stewardship Council ("Stewardship Council") to develop and implement a plan for the protection of such lands. In 2011, three proposals, including one by the Potter Valley Tribe, were submitted to the Stewardship Council for consideration for a donation of fee title to certain lands located within the Eel River planning unit. In 2012, the Stewardship Council Board of Directors recommended the Tribe to receive approximately 723 acres of land at the Eel River Planning Unit located in Mendocino County. The transaction required a conservation easement on the land and a

[26] ASI. (2004). A Short History of Potter Valley. A report by Archaeological Services, Inc, Kelseyville, Ca. Tribal records, Ukiah, Ca.

limited waiver of sovereign immunity from the Tribe, as well as agreement from the Tribe not to have the land placed into trust.

In 2014, the Stewardship Council Board of Directors recommended the Tribe to receive approximately 219 acres of land at the Eel River (Lower Trout Creek) Planning Unit located in Mendocino and Lake Counties. On July 24, 2019, after over 12 years of advocacy, the Tribe and PG&E finally closed on the donative fee transfer property. In the end, the Tribe received 879 acres back of its ancestral lands. However, the Tribe consistently requested the rest of the land associated with the Potter Valley Project that was not identified as needed for the FERC power project:

- **2013- The Tribe requested balance of retained lands and the PVP from the Stewardship Council.**
- **2013- Followed up with clarification regarding request for Parcel 748.**
- **2017- Proposed a compromise involving a parcel split.**
- **2019 – Requested retained lands again.**
- **2020-2023- Sought to join orphaned project discussions.**
- **NO ANSWER EVER GIVEN TO THE TRIBE**

The Potter Valley Tribe has consistently expressed its goal to obtain the Potter Valley Hydro Project, and/or the retained land outside of the FERC boundary, but its requests to participate in discussions about the next phase of the orphaned project have been ignored. In November 2023, the Tribe submitted a formal letter to request consultation with Proponents of the New Eel-Russian Facility but has yet to receive a response.

Potter Valley Project

In May 2018, when the Tribe learned that the Potter Valley Project would be put up for sale through an auction process, it immediately became interested; the Potter Valley Project sits on its ancestral homelands adjacent to the lands acquired from PG&E through the Stewardship Council process and the Tribe wishes to regain the lands and the Potter Valley Project. The Tribe contemplated submitting an offer through the auction process, but in January 2019, PG&E filed for bankruptcy and submitted to FERC a "Notice of Withdrawal of Notice of Intent to File License Application and Pre-Application Document." This essentially orphaned the Project and the auction ceased.

In February 2019, the Tribe wrote to the Stewardship Council and proposed the donation of Potter Valley Project lands to the Tribe but was quickly told this was not a possibility. In May 2019, the Tribe wrote to Rep. Huffman, the Mendocino Inland Water and Power Commission, and the Eel Russian River Commission requesting a seat at the table in discussions related to the future of the Potter Valley Project. The Tribe did not receive responses from any of the organizations.

The Potter Valley Project sits on the Tribe's ancestral lands, and the Tribe has a vested interest in what happens to the land and natural resources in its surrounding community. The Tribe has made it a priority to acquire its aboriginal lands, build its territorial base, and protect the cultural and natural resources of its territory. The Tribe respectfully requests inclusion and participation in any effort that discusses and seeks to acquire the Potter Valley Project. As an original inhabitant of the land, the Tribe can add a unique perspective to the acquisition and help to adequately represent its Tribal interests.

Conclusion

The Potter Valley Tribe has obtained some of the land in the Eel River Planning Unit through the Stewardship Council process, however, the Tribe's subsequent efforts to participate in planning for the remaining lands and the PVP have largely been ignored. It is difficult to understand why the Tribe's repeated requests to participate have gone unnoticed, particularly because the Tribe owns the adjacent land and has expressed its consistent desire to obtain the balance of the non-FERC retained lands through the CPUC Tribal Land Return Policy procedure.

At this point, we request that a formal package be sent to the Tribal Office that contains all pertinent information regarding this Plan. We also request that you copy all correspondence to our attorney, Michelle Lee, michelle@thecirclelaw.com, The Circle Law Group, P.C., 930 F Street, Sacramento, CA 95814. It is imperative that we be included in all future communications and even more importantly, that we have a meeting with the appropriate staff to discuss how the Tribe can participate more effectively in this complex transition.

We look forward to hearing from you as soon as possible.

Sincerely,

Salvador Rosales
Tribal Chairman

PINOLEVILLE POMO NATION

500 B. Pinoleville Ukiah, CA 95482
phone: 707-463-1454 fax: 707-463-6601

DATE: December 13, 2023
TO: Pacific Gas and Electric
Tony Gigliotti@PGE.com

RE: Potter Valley Project Dam Decommissioning

Dear Tony Gigliotti,

The Pinoleville Pomo Nation is respectfully submitting comments regarding the proposed project to decommission the Potter Valley Project, including the removal of Scott Dam and Van Arsdale Dam. As you know the Potter Valley Project has significant effects on three watersheds: the Russian River Watershed, Eel River Watershed, and Clear Lake Watershed. The fisheries in all three watersheds are threatened, with species listed and facing extinction. Pinoleville Pomo Nation has considerable concerns about the impacts of the newly formed Joint Powers of Authority on restructuring the water allocation and costs, impacting on the most vulnerable socially disadvantaged community members and the watersheds, ecosystem, and fisheries. It has not been a transparent process for creating the JPA, (quite the opposite) who the Board Members are or how they were chosen, including a lack of process for equitable representation of socially disadvantaged communities who would be most impacted by reduced water allocations and increased water rates. This is a very costly project proposal, without clear sources of funding. While it's those who put the most money into the project looking to receive the largest allocation of water (Mendocino Inland Power and Water Commission and Sonoma County/Sonoma Water Agency), this once again overlooks the needs of the Upper Russian River community, the fishery, and the three watershed wide ecosystems. Future rate hikes increase the risk of socially disadvantaged communities facing water disconnections due to inability to pay higher rates and curtailments while providing water to more affluent communities and segments of the economy. Moving forward the JPA and Board must also address assumptions that water supplies will be based on "demand", as thus far there are no visible and substantial components to enforce "demand reduction" i.e. water conservation programs to realistically support a sustainable fishery, environment, and economy. There are 22 Federally Recognized Tribes in Sonoma, Lake and Mendocino County, all Sovereign Nations with distinct culture, language, governance, and relationships. One Tribe cannot speak for another, nor can one Tribe (Round Valley Tribes) in a separate distinct watershed represent the needs of Tribes in another distinct watershed, or fishery. The Russian River fishery has collapsed, Central Coast Steelhead, Coho, and Chinook Salmon that depend on the Russian River Watershed are listed as threatened Continuing the status quo on water allocation (which is highly likely given the circumstance) and management in the Russian River Watershed will guarantee the extinction of several salmon species, and that would be tragic, not only for Pinoleville Citizens, but for all future generations.

Since time immemorial the people now called Pinoleville Pomo Nation citizens lived in Potter Valley, (Be-lo-kai, or verdant valley in Northern Pomo language) developing reciprocal relationships with the land, waters, plants, fisheries, birds, mammals, and neighboring communities. Decades before the formation of the Potter Valley Irrigation District Pinoleville Citizens created and continued to tend a vibrant landscape and upper Russian River fishery once capable of supporting their healthy community. Pinoleville citizens were forcibly removed from their homelands in Potter Valley where they lived since time immemorial in1870, when during a "Bloody Run" Tribal Citizens were rounded up and forcibly marched to Round Valley, along a creek now called Bloody Creek as the Creek ran red with their blood from the march. Pinoleville Citizens returned to Ukiah, purchasing land adjacent to Ackerman Creek north of Ukiah to house not only their people, but displaced homeless from other Tribes. Pinoleville has continued to heal, grow, and maintain community services for all Tribal members regardless of their affiliation, while maintaining their strong relationships with the land and waters. There have been many challenges for Pinoleville Citizens for generations, most recently drought, wildfires, collapse of the fishery, and recently having a moratorium on water hook-ups on the Reservation, restricting ability of the Tribe to build critically needed housing for unhoused Tribal Citizens.

The Pinoleville Pomo Nation was terminated by Federal actions in 1966 and was only able to regain Federal Recognition in 1983 when Pinoleville Citizen Tillie Hardwick took her case to the Supreme Court to reinstate Federal Status. Only one Tribe in this area was included in consultation during the last FERC dam licensing, (Round Valley Tribes), probably due to many of the neighboring Tribes also being terminated during this time. It's critical that the JPA, Board, and neutral oversight of the process allows for the actual participation of Tribes in the Russian River watershed on the Board of this project. Pinoleville Pomo Nation will be expecting consultation during this transition of water resources that will impact not only this generation of Pinoleville Citizens, but the lands, waters, fisheries, and communities for the foreseeable future. To summarize concerns:

- Lack of transparency of JPA.
- Lack of Russian River Watershed Tribal participation on JPA Board.
- Future water allocations for Tribes being restricted.
- Future water rates being increased to unmanageable levels.
- Lack of environmental impact study on Upper Russian River fishery and ecosystem.
- Impacts on threatened with extinction Central California Coast Coho, California Chinook, and Central Coast Steelhead.
- Lack of economic and environmental planning to adapt to changing climate.

- Lack of study on downstream impacts on water quality and quantity.
- Lack of watershed-based planning for water conservation.

Thank you for taking these comments into consideration. Please contact the Pinoleville Pomo Nation for further information or clarification of comments.

Respectfully submitted by,

Leona L. Williams
Tribal Chairperson
Pinoleville Pomo Nation

Tony Gigliotti
Senior Licensing Project Manager
Power Generation
12840 Bill Clark Way
Auburn, CA 95602
E-mail: PVSurrender@pge.com

RE: Comments on the Initial Draft Surrender Application

On behalf of the Wiyot Tribe this letter conveys our concerns regarding the Initial Draft Surrender Application.

Scott Dam Area – Decommissioning of Project Facilities/Features

Page 4-6 The reservoir storage at the start of the drawdown period (June) will be approximately 50,000 acre-feet at an elevation of 1,900 feet.

Page 4-8 Initial Low-flow Season Activities: June – October (1st Year)

June is a critical migration and spawning period for Pacific lamprey in the Eel River. Assuming Pacific lamprey have migrated upstream of Scott Dam by this time, PG&E should take precaution in responsible fish relocation of any Pacific lamprey juvenile ammocoetes residing in the substrate, migrating adults, and holding adults that may be impacted by the drawdown.

Page 4-7 Following pre-established protocols related to river flow forecasting, the explosives would be detonated during or preceding and anticipated flood event of sufficient magnitude to evacuate fine sediment deposits from the reservoir (likely between December and March).

December – March is a critical time frame for migration and spawning of coho salmon and steelhead trout. PG&E should take precautions in responsible fish relocation of either species and take efforts to reduce the chances of incidental take.

Page 4-12 Lake Pillsbury – PG&E will restore the former inundation zone, including the historic river channel.

Demand more details of what 'restore' entails. Restoration should entail restoring river and riparian function, collecting native seeds for revegetation, controlling non-native species such as Sacramento pikeminnow and large-mouth bass, and ensuring native fish (coho salmon, chinook salmon, steelhead/rainbow trout, Pacific lamprey, green sturgeon) are not negatively impacted by restoration actions.

1000 Wiyot Drive • Loleta, California 95551 • (707) 733-5055 • (800) 388-7633 • FAX (707) 733-5601

Cape Horn Dam Area – Decommissioning of Project Facilities/Features

Page 4-16 The purpose of the control section would be to a) allow for volitional passage of salmonids across the range of fish passage design flows… The section would also be designed to meet state and federal fish passage criteria across the range of fish passage design flows.

Page 4-25 states the same purpose as above under Roughened Channel with Gravity Supply

Fish passage must also consider passage for Pacific lamprey. Fish passage often refers to passage criteria specific to salmon and steelhead, which is sometimes detrimental to Pacific lamprey especially if there are sharp angles incorporated in passage designs. Pacific lamprey do not jump like salmon and trout, rather they use their suctorial oral discs to climb up vertical surfaces. When faced with sharp (typically 90 degrees) angles on those surfaces, their discs are unable to continue past the angle. This prevents further upstream migration and congregations of Pacific lamprey are left vulnerable to predation. Fish passage must be more than simply considered for Pacific lamprey but designed to allow Pacific lamprey to pass along with salmon and trout.

Page 4-26 Water conveyance to the East Branch Russian River would include the existing tunnel system and associated appurtenances.

Alternative C-2 Roughened Channel with Gravity Supply

These alternatives should be thoroughly evaluated to determine which best promotes fish migration at this site, and the feasibility of these options and their impacts on Pacific lamprey migration should specifically be included in that analysis.

Page 4-30 Van Arsdale Reservoir – PG&E will restore the former inundation zone, including the historic river channel.

Demand more details of what 'restore' entails. Restoration should entail restoring river and riparian function, collecting native seeds for revegetation, controlling non-native species such as Sacramento pikeminnow and large-mouth bass, and ensuring native fish (coho salmon, chinook salmon, steelhead/rainbow trout, Pacific lamprey, green sturgeon) are not negatively impacted by restoration actions.

Hu' (Thank You) for your time and consideration.

Juwaksh

Ted Hernandez
Chair Wiyot Tribe

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

BEA	Bureau of Economic Analysis
CT	Census Tract
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

PVID	Potter Valley Irrigation District
VOMWD	Valley of the Moon Water District

3.3.13 Socioeconomic Resources

This section describes the existing socioeconomic conditions in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). Specifically, the section describes potentially affected socioeconomic values and social groups, population levels and trends, employment and income levels and trends, and the local tax base. Socioeconomic conditions in the region are influenced by the availability and quality of natural resources in the area, including water supply and quality, land, fish and wildlife, and recreational opportunities. Potential environmental effects related to socioeconomics are addressed in Section 3.4.1.14.

3.3.13.1 Information Sources

The socioeconomic information presented in this section draws from the following data sources:

- California Department of Finance county population projections (California Department of Finance 2023, 2024);
- County websites and reports for Humboldt and Sonoma counties (Bohn et al. 2023; County of Humboldt 2023; Rivera 2023);
- Economic studies of the commercial fishing and recreation/tourism industries (California Sea Grant 2024; Dean Runyan Associates 2023; Hackett et al. 2009);
- Local newspaper articles and Friends of the Eel River reports (Bacher 2011; Huetti 2023);
- U.S. Bureau of Economic Analysis (BEA) data (BEA 2024);
- U.S. Census Bureau data (U.S. Census Bureau 2018–2022);
- Water district service area data (Sonoma Water 2024; Valley of the Moon Water District 2016); and
- Comments received from stakeholders on the ongoing license surrender process.

3.3.13.2 Description of the Study Area

The study area for socioeconomic resources is four northern California counties: Lake, Mendocino, Sonoma, and Humboldt counties. Scott Dam and Lake Pillsbury are located in Lake County, while Cape Horn Dam and Van Arsdale Reservoir are located in Mendocino County. Van Arsdale Reservoir was formed by Cape Horn Dam in 1907 and Lake Pillsbury by Scott Dam in 1921. Water diverted for hydroelectric generation by the Project to the East Branch Russian River has the ancillary effect of enhancing instream flows for fish and wildlife and increases the water supply for agricultural, municipal, and industrial uses in portions of Mendocino and Sonoma counties and other entities.[1] Further, Eel River flows downstream of the Project support water-based recreation, tourism, and fish and wildlife–related socioeconomic uses and values, primarily

[1] Water supplies from the Russian River system are also delivered to Marin County by the Sonoma Water conveyance system. Marin County is not included in this analysis as it is not known the extent to which diversions from the Project benefit water users in Marin County.

in Mendocino and Humboldt counties.[2] As such, water-related socioeconomic conditions and values in each of these four counties are described.

3.3.13.3 Overview of Potentially Affected Socioeconomic Values and Affected Social Groups

Socioeconomics refers to attributes of the human environment, specifically the demographic, social, and economic characteristics of an area and its population. Potentially affected socioeconomic values are broadly defined to include measures of social or economic well-being related to how people use and interact with natural resources, the environment, and each other. This includes resource uses and values related to agriculture, recreation, water supply, energy production, aesthetics, species abundance and preservation, quality of life, and public health. The relationship between the Project and potentially affected resources, social groups, and socioeconomic values is summarized in Table 3.3.13-1.

As described in Table 3.3.13-1, potentially affected socioeconomic values include economic opportunity (local jobs and income), government fiscal stability (tax revenues and expenditures), recreation value, energy reliability and costs, water reliability and costs, aesthetic values, community way of life, and the social and cultural value to people of preserving species and habitats. The associated potentially affected social groups include farmers/farmworkers, conservationists, recreationists/tourists, tourism/recreation industry workers, tribes, urban/suburban water users, and local residents. An individual may be a member of multiple social groups—for instance, a tribal member may also be a recreationist, farmer, or commercial angler.

3.3.13.4 Population and Affected Social Groups

Map 3.3.13-1 provides an overview of the population density in the study area and identifies the four study area counties, Project features, and waterways downstream of Project dams (highlighted in dark pink). Table 3.3.13-2 summarizes the 2022 population in the study area, as well as growth since 2010 and projected growth by 2050. As of July 1, 2022, the total study area population is estimated at 783,737 people, distributed as follows: 62 percent in Sonoma County, 17 percent in Humboldt County, 12 percent in Mendocino County, and 9 percent in Lake County. Over 40 percent of study area residents live in the cities of Santa Rosa, Petaluma, Eureka, Arcata, Ukiah, and Clearlake (the largest urban center in the study area is Santa Rosa, with 23 percent of the study area population). The remaining 60 percent of study area residents live in towns with fewer than 60,000 residents and in unincorporated areas. Since 2010, the populations of Humboldt, Mendocino, and Sonoma counties have grown by approximately 4 percent or less, well below the state average of 7 percent. However, the population of Lake County has grown slightly faster at a rate of 6 percent. The four-county study area population is projected to decline by 9 percent by 2050.

[2] The Eel River also flows through the very southwestern corner of Trinity County but there are few people inhabiting areas near the Eel River in Trinity County, so this county is not included in the socioeconomic study area.

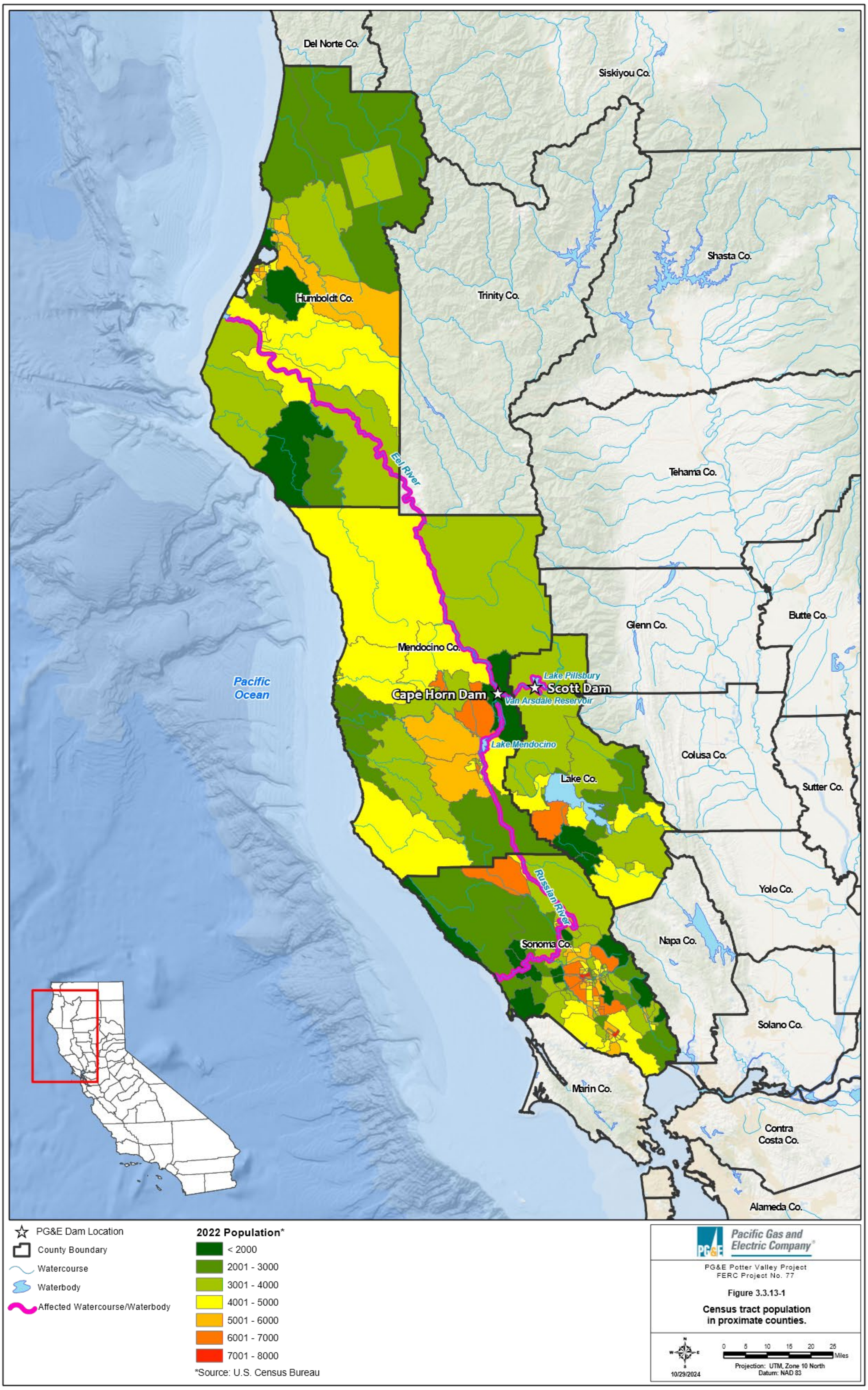
Table 3.3.13-1. Relationship between potentially affected resources, socioeconomic values, and social groups.

Socioeconomic Value (Social Groups)	Key Resources	Description
Tribal cultural and subsistence values (tribes)	Cultural resources, fish/wildlife, vegetation, water	Numerous tribes are in the study area. Cultural resources, fish and wildlife resources, and natural landscapes are closely associated with many different cultural and spiritual traditions as well as with tribal community identity (Bacher 2011). Chinook salmon and other fish resources are particularly important to tribal cultures, communities, and livelihoods in the North Coast region (California Sea Grant 2024).
Economic opportunities (farmers/ farmworkers, tourism workers/ proprietors, anglers, commercial fishing, local residents)	Agriculture/land use, commercial fishing, recreation, aesthetics, fish/wildlife	Water resources are used for out-of-stream consumptive uses such as agriculture, residential, and municipal uses, as well as for instream recreation/aesthetic/habitat conditions important to the recreation and tourism industries and the commercial fishing industries, and associated employment and income. The management of water in the study area is a key determinant of economic opportunities in terms of employment and income-generation potential. Specific to agricultural economic opportunity, the East Branch Russian River provides irrigation water to the Potter Valley Irrigation District in Mendocino County and to irrigators in the Russian River basin in Sonoma County, supporting employment and income associated with agricultural irrigation. There are seven port-based fishing communities in Humboldt and Mendocino counties within the study area: Trinidad, Eureka, Fields Landing, Shelter Cove, Fort Bragg, Albion, and Point Arena. The value of commercial salmon fishing in the study area is influenced by the abundance of salmon. Historically, the region supported an active salmon fishery; this fishing industry has been adversely affected by dwindling stocks and restrictions on salmon harvesting (California Sea Grant 2024). Water-based reservoir (Van Arsdale Reservoir, Pillsbury Lake, Lake Mendocino, and Lake Sonoma) and river (Eel River, Russian River) recreation and aesthetics attract tourists who spend money at local businesses and outfitters, supporting the local economy. Further, recreation opportunity attracts and retains residents, further supporting the local economy.

Socioeconomic Value (Social Groups)	Key Resources	Description
Recreation value (recreationists, local residents)	Recreation, vegetation, aesthetics, fish/wildlife	Study area residents and tourists derive value from diverse recreation activities in the study area (including those in and around Lake Pillsbury, Van Arsdale Reservoir, Lake Mendocino, the Eel River, and the Russian River). As described in Section 3.3.9, recreation activities include swimming, lake boating, whitewater boating, fishing, wind surfing, hiking, camping, and off-highway vehicle use. Recreationists and the socioeconomic value of recreation in the study area are influenced by the abundance and diversity of recreation opportunities, aesthetics, and fish and wildlife populations.
Energy costs and reliability (local residents)	Water, energy	Historically, the Project facilities generated hydroelectric power for PG&E. In 2019, PG&E determined that relicensing the Project would be contrary to the interests of its electric rate payers, and the Project has not generated electricity since 2021. Water diverted by the Project to the East Branch Russian River to generate hydroelectric power is then abandoned by the Project and is subsequently used downstream by the City of Ukiah Electric Utility Department to generate hydropower at the Mendocino Hydro Plant, which has a capacity of 3.5 megawatts. Additionally, there are three smaller, privately owned powerhouses downstream on the East Branch Russian River (BES Hydro Project, McFadden Hydro Project, and Hammeken Hydro Project) with the capacity to generate 1.18 megawatts.
Local government fiscal stability (local residents)	Aesthetics, agriculture/land use, recreation, public safety	Local governments provide public services for local residents, many of which are funded through property and sales taxes. Property tax collections in the study area are determined by levy rates and property values; property values in turn are influenced by the level of economic activity in the region and the desirability of property (which may be affected by such factors as aesthetics, water availability and cost, and recreation opportunity). In particular, waterfront property values and homes with views of water bodies typically have price premiums related to aesthetic amenities and associated higher property taxes.

Socioeconomic Value (Social Groups)	Key Resources	Description
Species/habitat intrinsic value (conservationists)	Fish/wildlife, vegetation, water	Habitat for fish and wildlife species and improvement in water quality in the study area, including the Eel River and the Russian River, is important to many stakeholders and conservation organizations in the study area, reflecting the value of species and habitats to these stakeholders. Local residents and conservation groups have expressed interest in preservation and restoration actions in the study area. For example, the Eel River Watershed Restoration and Conservation Program aims to restore aquatic habitat and species in the Eel River, with a focus on Chinook and coho salmon, steelhead, Pacific lamprey, and green sturgeon (California Trout 2022). As an example, in the Russian River basin, the National Fish and Wildlife Foundation invested more than $6 million between 2009 and 2020 in its Russian River Coho Program, which works to restore coho in the basin (National Fish and Wildlife Foundation n.d.).
Urban/suburban water reliability/cost (local residents)	Water	Project diversion of water from the Eel River to the Russian River basin for hydroelectric power generation has the ancillary benefit of enhancing downstream urban and suburban water supplies, including for residential, industrial, and agricultural uses. Water diverted by the Project to the East Branch Russian River flows from the East Branch Russian River into Lake Mendocino. Water in the Russian River, including water released from Lake Mendocino, is diverted and delivered by Sonoma Water to contractors that distribute water for public safety, domestic, commercial, and industrial purposes. In the Eel River basin, the Eel River is a major water source and recharges the groundwater basins that are the primary source of the basin's water supplies (Water Education Foundation n.d.).
Aesthetic value (local residents, recreationists, tourists)	Water, fish/wildlife, vegetation, land use	The views of water bodies and surrounding landscapes can enhance the aesthetic enjoyment of visitors and residents of the study area as well as enhance the value of residential and commercial properties located near water bodies. Views of lakes and rivers, riparian vegetation, and associated open space (including views of the Eel River, Russian River, Lake Mendocino, Van Arsdale Reservoir, and Lake Pillsbury and surrounding landscapes) are often particularly valued by tourists, property owners/local residents, and recreationists.
Community way of life (local residents)	Agriculture/land use, recreation, aesthetics, fish/wildlife, water, cultural resources	Community way of life is influenced by recreation opportunities, economic opportunities, natural and cultural resources, water reliability, and the ability to maintain traditional farming and fishing practices and lifestyle.

Socioeconomic Value (Social Groups)	Key Resources	Description
Public safety (local residents, tourists, recreationists)	Water	Water resources in the region are used for fire suppression and to protect public safety. Lake Pillsbury serves as an emergency water resource for firefighters, though California Department of Forestry and Fire Protection relies on Clear Lake more frequently (Huetti 2023). The Eel River and the Russian River are also used as water resources for fire suppression.



C:\Users\kgabel\OneDrive - Stantec\gisnt\185706343\map\SocioEcon\PGE_PotterValley_CensusTractPopulation_11i17i_10.mxd

Map 3.3.13-1. Census tract populations in proximate counties.

This Page Intentionally Left Blank

Table 3.3.13-2. Study area populations over time.

Area	2010 Population	2018 to 2022 Population	Projected 2050 Population	% Growth (2010–2022)	% Projected Growth (2022–2050)
California	36,637,290	39,356,104	40,049,519	7%	2%
Study Area					
Humboldt County	133,058	136,132	121,539	2%	-10.7%
American Indian Areas[a]	4,451	3,627	-	-19%	-
American Indian or Alaska Native Population	10,877	11,576	-	6%	-
City of Eureka	26,954	26,519	-	-2%	-
Eel River Watershed: CT 111	4,723	4,563	-	-3%	-
Eel River Watershed: CT 112	3,431	3,842	-	12%	-
Eel River Watershed: CT 116	3,310	3,905	-	18%	-
City of Arcata	17,100	18,536	-	8%	-
Lake County	64,371	68,024	67,065	6%	-1.4%
American Indian Areas[b]	564	1,078	-	91%	-
American Indian or Alaska Native Population	2,847	4,278	-	50%	-
Lake Pillsbury, Cape Horn Dam: CT 1	3,164	3,529	-	12%	-
Mendocino County	87,487	91,145	89,697	4%	-1.6%
American Indian Areas[c]	2,008	1,737	-	-13%	-
American Indian or Alaska Native Population	5,676	6,444	-	14%	-
City of Ukiah	15,942	16,496	-	3%	-
Hopland, Census-Designated Place	874	1,025	-	17%	-
Population in Potter Valley Irrigation District[d]	~1,000	~1000	-	0%	-

Area	2010 Population	2018 to 2022 Population	Projected 2050 Population	% Growth (2010–2022)	% Projected Growth (2022–2050)
Eel River Watershed: CT 101	2,617	2,842	-	9%	-
Eel River Watershed: CT 102	3,355	3,173	-	-5%	-
Eel River Watershed: CT 106.02	(part of larger CT)	4,421	-	-	-
East Russian River/Eel River CT 108.01 (near Lake Mendocino)	6,108	5,908	-	-3%	-
Near Van Arsdale Reservoir, Cape Horn Dam, and Russian River, Eel River Watersheds): CT 108.02	1,915	1,548	-	-19%	-
Lake Mendocino: CT 109	4,683	5,568	-	19%	-
Lake Mendocino: CT 117	4,240	4,691	-	11%	-
Sonoma County	474,047	488,436	434,406	3%	-11.1%
Stewarts Point American Indian Area	130	169	-	30%	-
American Indian or Alaska Native Population	10,699	15,802	-	48%	-
Santa Rosa City[e]	162,647	178,221	-	10%	-
Petaluma[e]	56,689	59,682	-	5%	-
Rohnert Park[e]	40,521	44,461	-	10%	-
Windsor[e]	25,760	26,320	-	2%	-
Cotati[e]	7,073	7,545	-	7%	-
Sonoma[e]	10,292	10,702	-	4%	-
Russian River Watershed: CT 1539.05	(part of larger CT)	3,410	-	-	-
Russian River Watershed: CT 1541	4,754	3,717	-	-22%	-
Russian River Watershed: CT 1542.01	3,782	3,656	-	-3%	-

Area	2010 Population	2018 to 2022 Population	Projected 2050 Population	% Growth (2010–2022)	% Projected Growth (2022–2050)
Near Lake Sonoma: CT 1542.02	5,906	6,544	-	11%	-
Near Lake Sonoma: CT 1543.04	2,541	2,010	-	-21%	-
Near Lake Sonoma: CT 1540	2,787	2,294	-	-18%	-
Total Study Area	**758,963**	**783,737**	**712,707**	**3%**	**-9.1%**

Sources: California Department of Finance 2023, 2024; U.S. Census Bureau 2011, 2018–2022; Valley of the Moon Water District 2016

a Note that estimates of small populations can have margins of error greater than or equal to the actual estimate. Such is the case for many of the smaller tribes included in these estimates. Humboldt County includes Big Lagoon, Blue Lake, Hoopa, Rohnerville, Table Bluff, Trinidad, and Yurok American Indian Areas.

b Includes Big Valley, Middletown, Robinson, Sulphur Bank, and Upper Lake American Indian Areas.

c Includes Coyote Valley, Guidiville, Hopland, Manchester-Point Arena, Pinoleville, Redwood Valley, Round Valley, and Sherwood Valley American Indian Areas, plus Potter Valley population served (Potter Valley Tribe 2022).

d Population is an estimate based on Potter Valley Irrigation District's reported 390 farmers, which remained the same between 2011 and 2024, the assumption of one farmer per household, and Mendocino County's average number of persons per household, according to the 2010 American Community Survey 1-year estimates and the 2018–2022 American Community Survey 5-year estimates published by the U.S. Census Bureau.

e There are towns that receive drinking water from Sonoma Water, with this supply partially reliant on the water diverted by the Project to the East Branch Russian River for hydroelectric production and then subsequently abandoned by the Project (Sonoma Water 2024).

In addition to population at the county level, Table 3.3.13-2 identifies other population areas within the study area:

- Residents living near the 2,280-acre Lake Pillsbury reservoir, formed by Scott Dam. Over 3,000 people in Lake County live in Census Tract (CT) 1, which surrounds the lake. The lake in this region supports recreation and tourism, is an aesthetic amenity, and serves as an emergency water resource for firefighters, though California Department of Forestry and Fire Protection relies on Clear Lake more frequently (Huetti 2023).
- Communities living along or near the Eel River. The Eel River supports the economy, community identity, and lifestyle of the region by providing recreation opportunities, scenic resources, fish and wildlife resources, and water supply. In Mendocino County, communities living near the Eel River include approximately 18,000 people (CT 101, CT 102, CT 106.02, CT 108.01, and CT 108.02), while in Humboldt County they include approximately 12,000 people (CT 111, CT 112, and CT 116).
- Tribes in the region who have deep cultural and spiritual connections to the region's waterways, fisheries, and other natural resources and landscapes. Some tribes have reserved water and fishing rights in the study area. As shown in Table 3.3.13-3, American Indian Areas in the study area have a total population of approximately 6,611, of which over half reside in Humboldt County. The population of all individuals identifying as American Indian or Alaska Native, alone or in combination with other races, was estimated by the U.S. Census Bureau to be 38,100 in the study area in the period 2018 to 2022.
- Communities living along or near the East Branch Russian River, the Russian River, or Lake Mendocino. These local communities depend on these water bodies for fishing, recreation, and water supplies for drinking water, irrigation, and commercial activities.
  - Farmers and ranchers in Potter Valley Irrigation District (PVID) irrigate with water from the Eel River basin that is diverted through the Project facilities for hydroelectric production and has the ancillary benefit of providing the majority of PVID's water supply for irrigation (PVID 2008). Within its 6,900-acre district boundary, PVID serves 390 members, irrigating approximately 4,900 acres. Assuming one farmer per household and an average household size of 2.57 people (Mendocino County average according to the U.S. Census Bureau for 2018 to 2022), approximately 1,000 people may live in the households irrigated by PVID.
  - Communities adjacent to and downstream from Lake Mendocino rely on water supplies from Lake Mendocino, which is partly supplied by abandoned Project water. Water from Lake Mendocino supports drinking water and water for public safety, commercial, and industrial purposes for 30,000 people in Mendocino County, including about 12,000 in the vicinity of Lake Mendocino, 1,000 in Hopland, and 16,500 in Ukiah (Inland Water and Power Commission 2023). The communities of Cloverdale, Geyserville, and northern Healdsburg in Sonoma County, with approximately 14,000 people (CT 1541, CT 1542.01, and CT 1542.02) also depend on water from Lake Mendocino.

- Farmers and winemakers between Lake Mendocino and into northern Sonoma County use irrigation water supplied from water diverted by the Project to the East Branch Russian River and abandoned by the Project after its use in hydroelectric generation in the Project powerhouse.
- Communities farther south and west are also supported by water supplies from the Russian River after its convergence with Dry Creek. Water is distributed to communities by Sonoma Water.

3.3.13.5 Employment and Income

Table 3.3.13-3 summarizes key indicators of employment, income, and educational attainment in each of the study area counties and compares the county data to the state level data. Data highlighted in red indicate lower average economic and educational attainment in counties in the study area compared to the state average. The data in Table 3.3.13-3 highlight that Humboldt, Lake, and Mendocino counties have higher unemployment and poverty, lower median income, and generally lower levels of educational attainment than elsewhere in the study area and the state (the exceptions are that Humboldt County has a slightly higher proportion of adults with a high school degree than the statewide average). In contrast, Sonoma County has lower levels of poverty and unemployment and higher levels of income and educational attainment than elsewhere in the study area and the state.

This section presents information on the levels of employment and income supported in different economic sectors in the study area. In particular, the section focuses on employment and income in the following industries, which are particularly reliant on water supplies and water management:

- **Outdoor recreation and tourism,** which is influenced by the availability and quality of water-based recreation and tourism and recreationally important fish and wildlife;
- **Commercial fishing**, which is influenced by the abundance of commercially important fish species such as salmon;
- **Farming and ranching** in the Russian River basin, particularly areas in Mendocino and Sonoma counties that rely on water diverted by the Project from the Eel River to the East Branch Russian River for hydroelectric use that has an ancillary benefit as an irrigation water source, and in the Eel River basin in areas that rely on groundwater recharge from the Eel River; and
- **Other economic sectors**, since water supply reliability or cost can influence commercial or industrial businesses, quality of life, and the ability of communities in the study area to retain and attract residents and businesses.

In addition to being sources of employment and income, farming/ranching, fishing, and tourism associated with outdoor recreation are also important to community way of life and identity in the study area.

Table 3.3.13-3. Key employment, income, and educational attainment characteristics in California and counties within the study area, 2018–2022.

Statistic	California	Humboldt County	Lake County	Mendocino County	Sonoma County
Unemployment Rate	6.40%	9.20%	10.40%	9.10%	5.20%
Poverty Rate	12.10%	19.80%	16.60%	16.20%	8.90%
Children in Household Receiving Public Assistance	24.20%	29.50%	36.20%	24.60%	14.20%
Median Income	$91,905	$57,881	$56,259	$61,335	$99,266
Percent of Population 18+ with High School Degree	85.10%	86.2%	65.3%	73.9%	88.8%
Percent of Population 25+ with Bachelor's Degree	35.90%	31.1%	18.2%	24.0%	37.8%

Source: U.S. Census Bureau 2018–2022 (data collected during the period from 2018 to 2022): Tables DP03, B09010, B15001, S1502, S1701, and B19083.

The BEA provides data by economic sector on income and employment for both workers and proprietors. Table 3.3.13-4 summarizes BEA economic data for 2022 by county. Federal and state agency reporting of employment and income do not present employment and income data for tourism/recreation as it is not a distinct economic sector; similarly, commercial salmon fishing employment and income is not disclosed by federal and state agencies to protect confidentiality of businesses and individuals. Therefore, tourism-specific data were obtained from a study of the economics of tourism in California prepared for Visit California (Dean Runyan Associates 2023), and commercial salmon fishing industry-specific data were obtained from a 2009 study of the economics of California's commercial fisheries prepared for the California Department of Fish and Wildlife (Hackett et al. 2009). Table 3.3.13-4 highlights the relative contribution of the agricultural, tourism/recreation sectors, commercial fishing, and other economic sectors in each county in the study area based on these data sources. The data in Table 3.3.13-4 are for 2022 for all sectors except commercial fishing; the data for commercial salmon fishing are from 2006 (with labor income from 2006 inflated to 2022 dollars in Table 3.3.13-4 for consistency). Due to recent restrictions on commercial salmon fishing in the study area resulting from low salmon abundance, the income and employment supported by this sector in more recent years are likely much lower than the data presented from 2006.

Table 3.3.13-4. Farm and recreation/tourism employment and labor income in the study area, 2022.

County/Sector	Employment (Full- and Part-time Jobs)	Labor Income[a]
Humboldt County		
Farmworkers/Proprietors[b]	1,477	$90,175,000
Recreation/Tourism Sectors[c]	5,960	$258,000,000
Salmon-Related Commercial Fishing[d]	31	$1,080,000
Other Sectors	66,255	$4,035,075,000
Total	73,723	$4,384,330,000
% Farm-Related[b]	2%	2%
% Recreation Tourism-Related[b]	8%	6%
% Salmon Commercial Fishing-Related[d]	0%	0%
Lake County		
Farmworkers/Proprietors[b]	815	$13,947,000
Recreation/Tourism Sectors[c]	1,820	$61,000,000
Other Sectors	22,706	$1,250,603,000
Total	25,341	$1,325,550,000
% Farm-Related[b]	3%	1%
% Recreation Tourism-Related[c]	7%	5%

County/Sector	Employment (Full- and Part-time Jobs)	Labor Income[a]
Mendocino County		
Farmworkers/Proprietors[b]	1,670	$39,814,000
Recreation/Tourism Sectors[c]	5,740	$231,000,000
Salmon-Related Commercial Fishing[d]	100	$1,218,000
Other Sectors	41,450	$2,577,444,000
Total	48,960	$2,849,476,000
% Farm-Related[b]	3%	1%
% Recreation Tourism-Related[c]	12%	8%
% Salmon Commercial Fishing-Related[d]	0%	0%
Sonoma County		
Farmworkers/Proprietors[b]	5,945	$192,033,000
Recreation/Tourism Sectors[c]	21,150	$931,000,000
Salmon-Related Commercial Fishing[d]	48	$990,000
Other Sectors	285,002	21,774,223,000
Total	312,145	$22,898,246,000
% Farm-Related[b]	2%	1%
% Recreation Tourism-Related[c]	7%	4%
% Salmon Commercial Fishing-Related[d]	0%	0%
Study Area		
Farmworkers/Proprietors[b]	9,907	$335,969,000
Recreation/Tourism Sectors[c]	34,670	$1,481,000,000
Salmon-Related Commercial Fishing[d]	98,729	$29,640,633,000
Other Sectors	460,169	$31,457,602,000
Total	9,907	$335,969,000
% Farm-Related[b]	2%	1%
% Recreation Tourism-Related[c]	8%	5%
% Salmon Commercial Fishing-Related[d]	0%	0%

Sources: Bureau of Economic Analysis 2024; Dean Runyan Associates 2023; Hackett et al. 2009.

a Labor income includes wages and salaries, supplements to wages and salaries, and proprietor income.
b Based on 2022 farmworker statistics from the California Employment Development Department (2023) and the 2022 Census of Agriculture (National Agricultural Statistics Service 2024); the farm-related employment and income may be underestimated.
c There is no recreation/tourism sector in BEA county-reported data. Included here are data from a Dean Runyan Associates (2023) study of the direct employment and earnings supported by tourism spending in the study area counties.
d Data on commercial fishing are not included in BEA county-reported data. Included here is Highland Economics' analysis of data from a 2009 study (using 2006 data) commissioned by the California Department of Fish and Wildlife on the economic structure of the commercial fishing industry in California, including ex-vessel revenue by fishery and average direct employment

and labor income supported per million in ex-vessel revenue. The data presented here are from 2006 for the following fisheries: salmon, salmon/albacore, and salmon/crab. Labor income values are inflated from 2006 to 2022 dollars using the Gross Domestic Product Implicit Price Deflator.

As shown in Table 3.3.13-4, BEA data indicate that direct farm-related employment (including farmworkers and farm proprietors, some of whom may be part-time farmers) may account for approximately 2 percent of total employment in the study area and 1 percent of total labor income. In Mendocino County, farm sector employment represents approximately 3 percent of county employment. Agricultural production supports employment not just in the agricultural sector, but also in many supporting industries that provide seed, machinery, processing, and professional services to the agricultural sector. Further, in addition to employment and income opportunities, many farm proprietors and workers derive enjoyment from a rural, agricultural lifestyle and also benefit from being able to support their livestock animals through on-farm forage production.

A California study of the economics of tourism (Dean Runyan Associates 2023) estimated that in 2022 spending by visitors to study area counties totaled $2.75 billion and supported approximately 28,710 jobs and $1.22 billion in income in such sectors as accommodation, food services, transportation, and retail. This study concluded that the local recreation and tourism economy may directly support approximately 8 percent of employment and 5 percent of income in the study area in these sectors (see Table 3.3.13-4). Direct jobs supported by the tourism and recreation-related economy is particularly important in Mendocino and Humboldt counties as a proportion of the local economy, supporting 12 percent and 8 percent of employment, respectively, in these two counties (this compares to approximately 5 percent of total California jobs directly supported by tourism and recreation). Further, the natural resources that support the recreation industry also support the general quality of life and retention/attraction of residents to the region, which also contributes to the local economy.

Available data on commercial salmon fishing in the study area indicate that it has recently constituted a very small fraction (less than 0.5 percent) of the employment or income in each study area county. Historically, the region supported an active salmon fishery; the Eel River was once the third-largest producer of Pacific salmon and steelhead in California (National Oceanic and Atmospheric Administration 2017). This fishing industry has been adversely affected by dwindling stocks and restrictions on salmon harvesting (California Sea Grant 2024). The California commercial ocean salmon season was closed in 2023 and is closed again for 2024; the only other years closures have occurred were 2008 and 2009. Closures are due to a combination of factors affecting salmon abundance throughout California and Oregon. Commercial fishing boats based in northern California are affected by salmon abundance locally and elsewhere on the Pacific Coast as the commercial fleet often travels to other parts of the state or Oregon to catch fish (Alexander 2024). For many communities in the region, particularly tribal communities, fishing opportunities are important not just for livelihood but also for subsistence and cultural identity (California Sea Grant 2024).

Table 3.3.13-5 provides an overview of the distribution of employment in all sectors of the study area economy. Service and trade sectors, particularly government, healthcare, and retail trade, constitute a large share of the economy in each study area county. The table also highlights sectors in green that contribute a higher percentage of employment in the study area than at the state level.

Sectors particularly strong in the study area compared to the rest of the state include agriculture, forestry/fishing, construction, healthcare, and several sectors associated with tourism: accommodation and food services and retail trade. Sonoma and Mendocino counties also have strong manufacturing sectors.

Humboldt County's economy has historically been built on natural resource industries like timber production, manufacturing, dairy farming, cattle ranching, and fishing (Humboldt County 2017). While these traditional industries have declined over time, they still contribute to the county's economy. New industries have emerged that export more knowledge-based, specialty, and technology-driven products and services. Important industries today include forest products, tourism, fishing and aquaculture, education, research, dairy, specialty agriculture, information technology, arts/culture, and niche manufacturing. The industries with the greatest earnings in Humboldt County are government and government enterprises, providing 27.9 percent of all earnings, healthcare, providing 14.4 percent, and retail trade, providing 8.7 percent.

Similar to Humboldt County, the economy of Lake County is primarily driven by healthcare, tourism, and agriculture (Economic Forensics & Analytics 2018; Rural County Representatives of California, 2018). Lake County has a larger share of employment in sectors like healthcare, agriculture, and government compared to the statewide average. Conversely, it has a smaller share in sectors like information, finance, and transportation. The greatest proportions of earnings come from government (26.1 percent), healthcare and social services (21.4 percent), and retail trade (9.1 percent).

Table 3.3.13-5. Proportion of employment by sector in study area and comparison to statewide employment.

Economic Sector	Geographic Area					
	Humboldt County	Lake County	Mendocino County	Sonoma County	Study Area	California
Agriculture	2%	3%	3%	2%	2%	0.9%
Forestry, fishing, and related activities	2%	Not Disclosed	Not Disclosed	1%	1%	1%
Mining, quarrying, and oil and gas extraction	0%	Not Disclosed	Not Disclosed	0%	0%	0%
Utilities	Not Disclosed	1%	0%	0%	0%	0%
Construction	6%	7%	6%	7%	7%	5%
Manufacturing	4%	2%	6%	8%	7%	6%
Wholesale trade	2%	1%	2%	3%	3%	3%
Retail trade	11%	12%	12%	9%	10%	8%
Transportation and warehousing	Not Disclosed	3%	2%	3%	3%	6%
Information	1%	1%	1%	1%	1%	3%
Finance and insurance	3%	2%	2%	4%	4%	5%
Real estate and rental and leasing	5%	4%	5%	6%	5%	6%
Professional, scientific, and technical services	5%	4%	5%	8%	7%	9%
Management of companies and enterprises	1%	0%	0%	1%	1%	1%
Administrative and support and waste management and remediation services	4%	4%	5%	6%	6%	6%
Educational services	1%	1%	1%	1%	1%	2%
Healthcare and social assistance	14%	21%	13%	12%	13%	12%
Arts, entertainment, and recreation	2%	1%	2%	3%	3%	2%
Accommodation and food services	8%	6%	9%	8%	8%	7%
Other services (except public administration)	7%	7%	6%	6%	6%	6%

Economic Sector	Geographic Area					
	Humboldt County	Lake County	Mendocino County	Sonoma County	Study Area	California
Government and government enterprises	20%	16%	14%	9%	12%	11%

Note: Not disclosed – BEA suppresses data when there are limited business establishments in a sector to avoid disclosure of confidential information.

The Mendocino County economy includes agriculture, forestry, fishing, and tourism. Mendocino County's coastal regions are also home to a thriving wine industry, similar to Sonoma. However, as in Humboldt and Lake counties, the greatest earnings are in government (20.3 percent), followed by healthcare and social services (13.3 percent) and retail trade (10.2 percent).

Sonoma County is known for its agricultural and wine production industries. Its top three industries by employment are retail trade, healthcare, and accommodation and food services. Manufacturing provides the highest share of earnings (8.4 percent), followed by healthcare and social services and government, each providing 7.8 percent of all earnings.

3.3.13.6 Local Government Finance

Table 3.3.13-6 summarizes local government revenues by source for each county in the study area, including sales tax and lodging tax. Total tax revenues reflect the size of the counties' economies and populations, with Sonoma County revenues the highest, followed by Humboldt County. Property taxes as a percent of county revenue are highest in Lake (13 percent) and Sonoma (13 percent) counties, followed by Mendocino (11 percent) and Humboldt (5 percent) counties. Lodging taxes as a percent of county revenues are highest in Mendocino County (2 percent) and are less than 1 percent of revenues in the other three study area counties.

Table 3.3.13.-6. County revenue sources by study area county, budget year 2023–2024, million dollars (M $).

Category	Humboldt	Lake	Mendocino	Sonoma
Intergovernmental Transfers (M $)	$372.13	$166.72	$218.40	$906.94
Sales Tax (M $)	$5.98	$4.20	$28.81	$27.32
Property Tax (M $)	$28.02	$30.50	$42.38	$314.41
Lodging Tax (M $)	$3.00	$1.01	$8.68	$20.29
Licenses, Permits, and Franchise Fees (M $)	$2.19	$3.85	$4.90	$36.36
Other Taxes (M $)	$48.90	$4.36	$23.47	$181.48
Other (M $)	$107.73	$18.75	$75.58	$967.56
Total County Revenue (M $)	**$567.95**	**$229.39**	**$402.22**	**$2,454.36**

Sources: Bohn et al. 2023; County of Humboldt 2023; Moulton-Peters et al. 2023; Pyska et al. 2023; Rivera 2023

3.3.13.7 References

Alexander, Sage. 2024. California salmon season closed for second year in a row. Eureka Times Standard. April 11. Available at: https://www.times-standard.com/2024/04/11/california-salmon-season-closed-for-second-year-in-a-row/.

Bacher, D. 2011. Tribes join together to restore Eel River. Friends of the Eel River. October 21. Available at: https://eelriver.org/2011/10/21/tribes-join-together-to-restore-eel-river/.

BEA (U.S. Bureau of Economic Analysis). 2024. CAEMP25N total full-time and part-time employment by NAICS industry. April 20. Washington, D.C.

Bohn, R., M. Bushnell, M. Wilson, N. Arroyo, and S. Madrone. 2023. Adopted budget fiscal year 2023-2024. County of Humboldt, Eureka, CA.

California Department of Finance. 2024. Report P-2A: total population projections, 2020-2060. California and counties (baseline 2019 population projections; vintage 2023 release). Demographic Research Unit. March 8. Sacramento, CA.

California Department of Finance. 2023. Report P-1A: total population projections, California, 2020-2060 (baseline 2019 population projections; vintage 2023 release). Demographic Research Unit. July 19. Sacramento, CA.

California Employment Development Department. 2024. *Agricultural Employment in California*. Available at: https://labormarketinfo.edd.ca.gov/data/ca-agriculture.html.

California Sea Grant. 2024. North Coast. Available at: https://caseagrant.ucsd.edu/california-commercial-fisheries/regions/north-coast.

California Trout. 2022. The Eel River watershed restoration and conservation program. Available at: https://caltrout.org/eel-river-watershed-program.

Climate Change Resources. 2017. Marin-Sonoma. Available at: https://climatechangeresources.org/learn-more/states/california/marin-sonoma/.

County of Humboldt. 2023. All funds summary. County of Humboldt, Eureka, CA.

Dean Runyan Associates. 2023. The economic impact of travel in California. Prepared for Visit California. Dean Runyan Associates, Portland, OR.

Economic Forensics & Analytics. 2018. Lake County economic development strategy. County of Lake, Lakeport, CA.

Hackett, S.C., D.M. Hansen, D. King, and E. Price. 2009. The economic structure of California's commercial fisheries. California Department of Fish and Game. June 3. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=30741&inline.

Huetti, M. 2023. The loss of Lake Pillsbury, a potential collapse of Scott Dam—the latest from the Russian River water forum. Mendofever Mendocino County News. October 20.

Humboldt County. 2017. Chapter 9: Economic development element. In: Humboldt County General Plan. pp. 1–15. Eureka, CA.

Inland Water and Power Commission. 2023. Potter Valley Project timeline. Inland Water and Power Commission, Mendocino County, CA. March 28. Available at: https://mendoiwpc.com/our-shared-water/history/.

National Agricultural Statistics Service. 2024. 2022 Census of Agriculture - County Data. Washington, D.C.

National Fish and Wildlife Foundation. n.d. Russian River coho. Available at: https://www.nfwf.org/programs/russian-river-coho#:~:text=The%20National%20Fish%20and%20Wildlife,and%20dispersed%20for%20human%20use.

National Oceanic and Atmospheric Administration. 2017. Three key habitats on the Eel River: a comprehensive restoration. Available at: https://www.fisheries.noaa.gov/feature-story/three-key-habitats-eel-river-comprehensive-restoration.

Potter Valley Tribe. 2022. Preamble to the constitution of the Potter Valley Tribe. Available at: https://pottervalleytribe.com/about/.

PVID (Potter Valley Irrigation District). 2008. History of the Potter Valley project. Available at: https://www.pottervalleywater.org/history.html.

Pyska, J., M. Simon, B. Sabatier, E. Crandell, and M. Green. 2023. Adopted budget. County of Lake, Lakeport, CA.

Rivera, M.C. 2023. Adopted budget, fiscal year 2023-24. County of Sonoma, Santa Rosa, CA.

Rural County Representatives of California. 2018. Lake County economic & demographic profile. Center for Economic Development, Chico, CA.

Sonoma Water. 2024. About us. Available at: https://www.sonomawater.org/about-us#:~:text=We%20provide%20drinking%20water%20to,Water%20District%2C%20Town%20of%20Windsor.

U.S. Census Bureau. 2018–2022. Total population American Community Survey 5-year estimates. Washington, D.C.

U.S. Census Bureau. 2011. 2010: ACS 5-year estimates detailed tables. December. Washington, D.C.

Valley of the Moon Water District. 2016. History of VOMWD. Available at: https://www.vomwd.org/history.

Water Education Foundation. n.d. Eel River. Available at: https://www.watereducation.org/aquapedia-background/eel-river.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

EJ	environmental justice
FERC	Federal Energy Regulatory Commission
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
RVIT	Round Valley Indian Tribes of the Round Valley Reservation
USEPA	U.S. Environmental Protection Agency

This Page Intentionally Left Blank

3.3.14 Environmental Justice

3.3.14.1 Introduction

This section describes the existing environmental justice (EJ) conditions in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) Project No. 77.

Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, and Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, as amended, require federal agencies, such as FERC, to consider if the impacts of their decisions would be disproportionately high and adverse for EJ populations and communities in the surrounding vicinity. Therefore, this section provides pertinent information regarding EJ communities in the vicinity of the Project as a basis to determine whether the surrender of PG&E's license would result in disproportionately high and adverse impacts to those communities.

3.3.14.2 Information Sources

The information presented in this section is primarily based on data and guidance from the following sources:

- Data provided in the U.S. Census Bureau's 2018–2022 American Community Survey 5-Year Estimates (U.S. Census Bureau 2024a, 2024b, 2024c); and
- The U.S. Environmental Protection Agency's (USEPA's) *Promising Practices for EJ Methodologies in NEPA Reviews* (USEPA 2016).

3.3.14.3 Study Area

The Study Area for the EJ analysis is shown on Map 3.3.14-1 and includes the area within the FERC Project boundary and a 5-mile buffer area beyond the FERC Project boundary. The Study Area encompasses the entire Scott Dam and Cape Horn Dam areas and portions of the Eel River and Russian River watersheds.

3.3.14.4 Methodology

Census tract data available from the U.S. Census Bureau (U.S. Census Bureau 2024a) were used to identify EJ communities in the Study Area. Six separate census tract groups intersect the Study Area. These census tract groups are shown on Map 3.3.14-1 relative to the Study Area, identified as follows:

- Lake County, Tract 1, Block Group 1;
- Mendocino County, Tract 101, Block Group 1;
- Mendocino County, Tract 106, Block Group 1;

- Mendocino County, Tract 108.01, Block Group 1;
- Mendocino County, Tract 108.02, Block Group 1; and
- Mendocino County, Tract 108.02, Block Group 2.

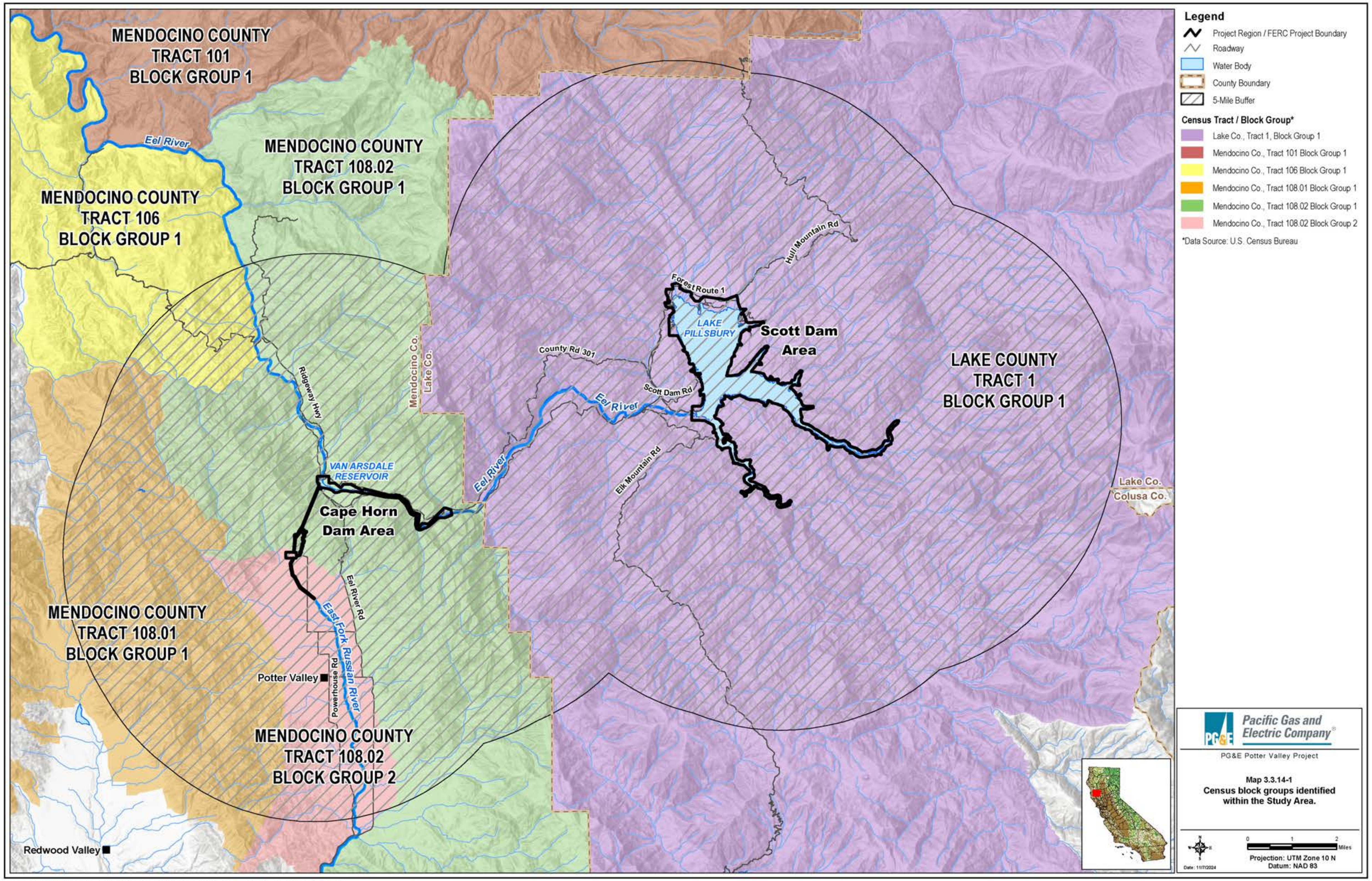
Corresponding racial, ethnic, poverty, and language statistics for each census tract or census block group identified above are presented in Tables 3.3.14-1 and 3.3.14-2. The information presented in these tables and the methods used to determine potential EJ communities are described below.

Relevant Racial, Ethnic, and Poverty Statistics: The following racial, ethnic, and poverty statistics are presented for each census tract or census block group that overlaps the Study Area: (1) total population; (2) total population of each racial and ethnic group (i.e., white alone not Hispanic, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, some other race, two or more races, Hispanic or Latino origin [of any race]) (count for each group); (3) minority population, including individuals of Hispanic, Latino, and Hmong origin as a percentage of total population; and (4) population below poverty level as a percentage of the total population. The information presented in these sections is from the U.S. Census Bureau's 2022 American Community Survey 5-Year (2018–2022) Estimates using Table #B03002 for race and ethnicity data and Table #B17017 for low-income household data (U.S. Census Bureau 2024a).

Potentially Affected Non-English-Speaking Groups and Sensitive Receptors: Existing information was reviewed to identify any non-English-speaking groups within each Study Area. The percentage of non-English-speaking households was compared to the percentage of such households in the reference county.[1] In each table, where the percentage of non-English-speaking households exceeds the percentage of such households in the reference county, the value is presented in red text. The information presented in these sections is based on the U.S. Census Bureau's 2022 American Community Survey 5-Year Estimates (U.S. Census Bureau 2024b, 2024c). In addition, any sensitive receptor locations were identified within each region. For this analysis, sensitive receptor locations are defined as areas where vulnerable populations may congregate, such as schools, childcare centers, and hospitals.

Potentially Affected EJ Populations and Communities: Potentially affected EJ populations were identified per census tract by applying the methods established in the USEPA's *Promising Practices for EJ Methodologies in NEPA Reviews* (USEPA 2016). Specifically, EJ communities were identified based on the presence of minority populations and use of the "50 percent" and the "meaningfully greater" analysis methods.

[1] Pursuant to the USEPA's *Promising Practices for EJ Methodologies in NEPA Reviews*, the selected reference community is intended to provide context and to determine an approximate baseline for determining disproportionate effects (USEPA 2016). For this analysis, the appropriate reference community was determined to be the county in which each geographic unit (i.e., census tract or census block group) is located. For example, when considering Lake County, Census Tract 1, Block Group 2, the reference community used in this analysis is Lake County. Because the reference community in this analysis is the relevant county, the term "reference county" is used in this document.



Map 3.3.14-1. Census block groups identified within the Study Area.

This Page Intentionally Left Blank

Table 3.3.14-1. Racial, ethnic, and poverty statistics for the census block groups that overlap the Study Area.

Geography	Race and Ethnicity Data										Low-Income Data
	Total Population	White Alone Not Hispanic	African American	Native American/ Alaska Native	Asian	Native Hawaiian & Other Pacific Islander	Other Race	Two or More Races	Hispanic or Latino	Total Minority[1] (%)[2,4]	Below Poverty Level (%)[3,4]
California	*39,356,104*	*13,848,294*	*2,102,510*	*114,271*	*5,861,649*	*135,460*	*176,652*	*1,499,338*	*15,617,930*	*65%*	*12%*
Lake County	68,024	45,259	1,507	1,579	905	199	249	2,654	15,672	33%	16%
Reference County Meaningfully Greater Analysis Threshold*										37%	–
Lake County, Census Tract 1, Block Group 2	987	645	2	65	119	0	0	93	63	35%	5%
Mendocino County	91,145	57,251	557	2,633	1,906	86	485	3,813	24,414	37%	16%
Reference County Meaningfully Greater Analysis Threshold*										41%	–
Census Tract 101, Mendocino County, California	2,842	1,009	3	764	11	0	0	203	852	65%	28%
Census Tract 106.01, Mendocino County, California	2,633	2,208	0	52	10	0	0	67	296	16%	11%
Census Tract 108.01, Mendocino County, California	5,908	3,451	19	322	0	0	2	212	1,902	42%	22%

Geography	Race and Ethnicity Data										Low-Income Data
	Total Population	White Alone Not Hispanic	African American	Native American/ Alaska Native	Asian	Native Hawaiian & Other Pacific Islander	Other Race	Two or More Races	Hispanic or Latino	Total Minority[1] (%)[2,4]	Below Poverty Level (%)[3,4]
Mendocino County, Census Tract 108.02, Block Group 1	460	413	6	16	6	0	0	7	12	10%	9%
Mendocino County, Census Tract 108.02, Block Group 2	1,088	853	0	0	13	0	0	103	119	22%	10%
Tribal Census Tract T001, Round Valley Reservation and Off-Reservation Trust Land	454	59	0	310	0	0	0	28	57	87%	27%

Source: U.S. Census Bureau 2024a

[1] "Minority" refers to the racial or ethnic groups included in the table except for the "White Alone Not Hispanic" category.

[2] Minority percentage values presented in red text represent values that exceed the threshold value for the reference county, as determined using the "meaningfully greater" analysis method. Minority percentage values presented in blue text represent values that exceed 50 percent.

[3] Percent below poverty values presented in red text represent values that are equal to or greater than the poverty level for the reference county.

[4] Percentages are rounded to the nearest whole number.

* The meaningfully greater analysis threshold for each reference county is calculated by adding 10 percent to the reference population's percent minority (i.e., multiply the percent minority in the reference population by 1.1).

Table 3.3.14-2. Language spoken at home in the census block groups that overlap the Study Area.

Geography	Population over 5 Years	Speak Only English at Home	Speak a Language Other than English at Home		
			Spanish	Other	Total Speak a Language Other than English at Home (%)
California	*37,097,796*	*20,809,671*	*10,478,088*	*5,810,037*	*44%*
Lake County	64,191	52,002	10,687	1,502	19%
Lake County, Census Tract 1, Block Group 2	3,309	2,835	366	90	14%
Mendocino County	86,201	68,235	15,166	2,800	21%
Census Tract 101, Mendocino County, California	2,575	2,031	511	33	21%
Census Tract 106.01, Mendocino County, California	2,562	2,374	102	86	7%
Census Tract 108.01, Mendocino County, California	5,654	4,709	864	81	17%
Mendocino County, Census Tract 108.02, Block Group 1	447	416	11	20	7%
Mendocino County, Census Tract 108.02, Block Group 2	1,065	1,001	39	25	6%
Tribal Census Tract T001, Round Valley Reservation and Off-Reservation Trust Land	302	264	22	16	13%

Source: U.S. Census Bureau 2024c

Note: Percentages are rounded to the nearest whole number. Percent who speak a language other than English at home values presented in red text represent values that are equal to or greater than the reference county.

The "50 percent" analysis method is used to determine whether the total percentage of the minority population in any census tract or census block group in the affected area exceeds 50 percent. In each table where the total minority population exceeds 50 percent, the value is presented in blue text.

The "meaningfully greater" analysis is used to determine whether the percentage of minority population in any affected census tract or census block group is 10 percent greater than the percentage of minority population in the reference population using the following process:

- Calculate the percent minority in the reference population (e.g., county).
- To the reference population's percent minority, add 10 percent (i.e., multiply the percent minority in the reference population by 1.1).
- This new percentage is the threshold each individual census tract or census block group's percent minority would need to exceed to qualify as an EJ community under the "meaningfully greater" analysis method.

In each table, the meaningfully greater analysis threshold is presented for each county. Where the total minority population exceeds the meaningfully greater analysis threshold, the value is presented in red text.

EJ communities were also identified based on the presence of low-income populations using the "low-income threshold criteria" method. The "low-income threshold criteria" method designates a community as an EJ community if the poverty level in the identified census block group is equal to or greater than that of the reference population (e.g., county). For this analysis, the reference population is the county in which the census tract or census block group is located. In each table where the percentage of the population below the poverty level is greater than the reference county, the value is presented in red text.

3.3.14.5 Study Area Demographic Information

Demographic information for each of these census tract groups that intersect the Study Area is summarized in the following subsections. Table 3.3.14-1 provides the relevant racial, ethnic, and poverty statistics for each census block group within the Study Area, as well as for Lake County, Mendocino County, and the State of California. Table 3.3.14-2 provides language statistics for the same groups. The numbers presented in these tables represent the entire census block, not just the portion of the census block that intersects the Study Area.

It should be noted that members of the Potter Valley Tribe and the Round Valley Indian Tribes of the Round Valley Reservation (RVIT) reside near the Project. As of 2019, the Potter Valley Tribe population was limited to 39 people (Potter Valley Tribe 2024). Racial, ethnic, and poverty statistics were not available for the Potter Valley Tribe. The RVIT reservation is located within the Eel River Watershed but outside of the Study Area. Data are presented for the RVIT in Tables 3.3.14-1 and 3.3.14-2 for informational purposes under "Tribal Census Tract T001, Round Valley Reservation and Off-Reservation Trust Land."

Lake County, Tract 1, Block Group 2

Lake County, Tract 1, Block Group 2 overlaps Scott Dam, Lake Pillsbury, the surrounding recreation facilities (see Map 3.3.14-1), and the Eel River to the upper end of Van Arsdale Reservoir. As shown in Table 3.3.14-1, the census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method.

As presented in Table 3.3.14-2, the census block group has a percentage of non-English-speaking households (14 percent) that is below the percentage of such households in Lake County. No school, childcare, or hospital locations were identified within the part of the census block group that is located within the Study Area. In summary, the percent of non-English-speaking households does not exceed the reference population and there are no identified sensitive receptor locations in the census block group. Based on the data, Lake County, Tract 1, Block Group 2 was determined to not meet the criteria as an EJ community.

Mendocino County, Tract 101, Block Group 1

A small region of Mendocino County, Tract 101, Block Group 1 intersects the northernmost portion of the Study Area due north of Lake Pillsbury and abuts the north side of the Eel River, outside of the Study Area (see Map 3.3.14-1). This census tract also includes the community of Covelo and the Round Valley Reservation to the north, but both are located outside of the Study Area beyond the map extent. As shown in Table 3.3.14-1, Mendocino County, Tract 101, Block Group 1 was identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, and the "low-income threshold criteria" method.

As presented in Table 3.3.14-2, the census block group has a percentage of non-English-speaking households (21 percent) that is equivalent to the percentage of such households in Mendocino County. No school, childcare, or hospital locations were identified within the part of the census block group that is located within the Study Area. Based on the data, Mendocino County, Tract 101, Block Group 1 was determined to meet the criteria as an EJ community.

Mendocino County, Tract 106, Block Group 1

A small portion of Mendocino County, Tract 106, Block Group 1 intersects the northwest portion of the Study Area northwest of Cape Horn Dam and abuts the south side of the Eel River, outside of the Study Area (see Map 3.3.14-1). As shown in Table 3.3.14-1, the census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method.

As presented in Table 3.3.14-2, the census block group has a percentage of non-English-speaking households (7 percent) that is below the percentage of such households in Mendocino County. No school, childcare, or hospital locations were identified within the part of the census block group that is located within the Study Area. In summary, the percent of non-English-speaking households does not exceed the reference population and there are no identified sensitive receptor locations in the census block group. Based on the data, Mendocino County, Tract 106, Block Group 1 was determined to not meet the criteria as an EJ community.

Mendocino County, Tract 108.01, Block Group 1

A portion of Mendocino County, Tract 108.01, Block Group 1 intersects the Study Area west of Cape Horn Dam and west of the East Branch Russian River (see Map 3.3.14-1). The census tract is located north of the city of Ukiah and does not include any incorporated cities or towns. As shown in Table 3.3.14-1, this census block group was identified to be an EJ community using the "meaningfully greater" analysis method and the "low-income threshold criteria" method.

As presented in Table 3.3.14-2, the census block group has a percentage of non-English-speaking households (17 percent) that is below the percentage of such households in Mendocino County. No school, childcare, or hospital locations were identified within the part of the census block group that is located within the Study Area. In summary, the percent of non-English-speaking households does not exceed the reference population and there are no identified sensitive receptor locations in the census block group. Based on the data, Mendocino County, Tract 108.01, Block Group 1 was determined to meet the criteria as an EJ community.

Mendocino County, Tract 108.02, Block Group 1

Mendocino County, Tract 108.02, Block Group 1 overlaps much of the Cape Horn Dam Area as well as portions of the Eel River downstream of Cape Horn Dam (see Map 3.3.14-1). As shown in Table 3.3.14-1, the census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method.

As presented in Table 3.3.14-2, the census block group has a percentage of non-English-speaking households (7 percent) that is below the percentage of such households in Mendocino County. No school, childcare, or hospital locations were identified within the part of the census block group that is located within the Study Area. In summary, the percent of non-English-speaking households does not exceed the reference population and there are no identified sensitive receptor locations in the census block group. Based on the data, Mendocino County, Tract 108.02, Block Group 1 was determined to not meet the criteria as an EJ community.

Mendocino County, Tract 108.02, Block Group 2

Mendocino County, Tract 108.02, Block Group 2 is bisected by the East Branch Russian River and includes the community of Potter Valley (see Map 3.3.14-1). As shown in Table 3.3.14-1, the census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method.

As presented in Table 3.3.14-2, the census block group has a percentage of non-English-speaking households (6 percent) that is below the percentage of such households in Mendocino County. Potter Valley Elementary School and Potter Valley High School are located within the Study Area.

The nearest hospital locations are in the city of Willits and city of Ukiah. In summary, the percent of non-English-speaking households does not exceed the reference population and there are no identified sensitive receptor locations in the census block group. Based on the data, Mendocino County, Tract 108.02, Block Group 2 was determined to not meet the criteria as an EJ community.

3.3.14.6 References

Potter Valley Tribe. 2024. Preamble to the Constitution of the Potter Valley Tribe. Available at: https://pottervalleytribe.com/about/. Accessed January 2024.

U.S. Census Bureau. 2024a. 2018–2022 American Community Survey 5-Year Estimates; Table #B03002 for race and ethnicity data and Table #B17017 for low-income data. Available at: https://data.census.gov/. Accessed January 2024.

U.S. Census Bureau. 2024b. 2018–2022 American Community Survey 5-Year Estimates; Table #S1601 for language spoken at home. Available at: https://data.census.gov/. Accessed January 2024.

U.S. Census Bureau. 2024c. 2018–2022 American Community Survey 5-Year Estimates; Table #S1603 for characteristics of people by language spoken at home. Available at: https://data.census.gov/. Accessed January 2024.

U.S. Environmental Protection Agency (USEPA). 2016. Promising Practices for EJ Methodologies in NEPA Reviews. Available at: https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf. Accessed January 2024.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

BAAQMD	Bay Area Air Quality Management District
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CO	carbon monoxide
GCAPCD	Glenn County Air Pollution Control District
LCAQMD	Lake County Air Quality Management District
MCAQMD	Mendocino County Air Quality Management District
NAAQS	National Ambient Air Quality Standards
NCUAQMD	North Coast Unified Air Quality Management District
NO_2	nitrogen dioxide

NOx	oxides of nitrogen
NoSoCo Air	Northern Sonoma County Air Pollution Control District
O_3	ozone
Pb	lead
PG&E	Pacific Gas & Electric Company
PM	particulate matter
$PM_{2.5}$	particulate matter with a diameter of 2.5 microns or less
PM_{10}	particulate matter with a diameter of 10 microns or less
Project	Potter Valley Hydroelectric Project
ROG	reactive organic gas
SIP	State Implementation Plan
SO_2	sulfur dioxide
USEPA	U.S. Environmental Protection Agency

3.3.15 Air Quality

3.3.15.1 Introduction

This section describes the air quality setting in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project), Federal Energy Regulatory Commission Project No. 77. Specifically, this section provides background information regarding criteria air pollutants and ambient air quality standards. In addition, it describes the existing air quality setting and attainment status in each of the four Project regions: Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and Russian River Watershed (see Map 3.3.15-1). Potential environmental effects related to air quality are addressed in Section 3.4.1.16.

3.3.15.2 Information Sources

The information presented in this section is primarily based on data and guidance from relevant air districts and public agencies, including the following:

- Bay Area Air Quality Management District's (BAAQMD's) current air quality plan (BAAQMD 2024);
- California Air Resources Board's (CARB's) published table of applicable California and National Ambient Air Quality Standards (CARB 2016);
- Lake County Air Quality Management District's (LCAQMD's) website (LCAQMD 2024);
- Mendocino County Air Quality Management District's (MCAQMD's) Particulate Matter Attainment Plan and published air quality setting information (MCAQMD 2005, 2024); and
- U.S. Environmental Protection Agency's (USEPA's) published information on criteria pollutants and adopted National Ambient Air Quality Standards (USEPA 2024a, 2024b, 2024c).

3.3.15.3 Background Information

Applicable Regulations

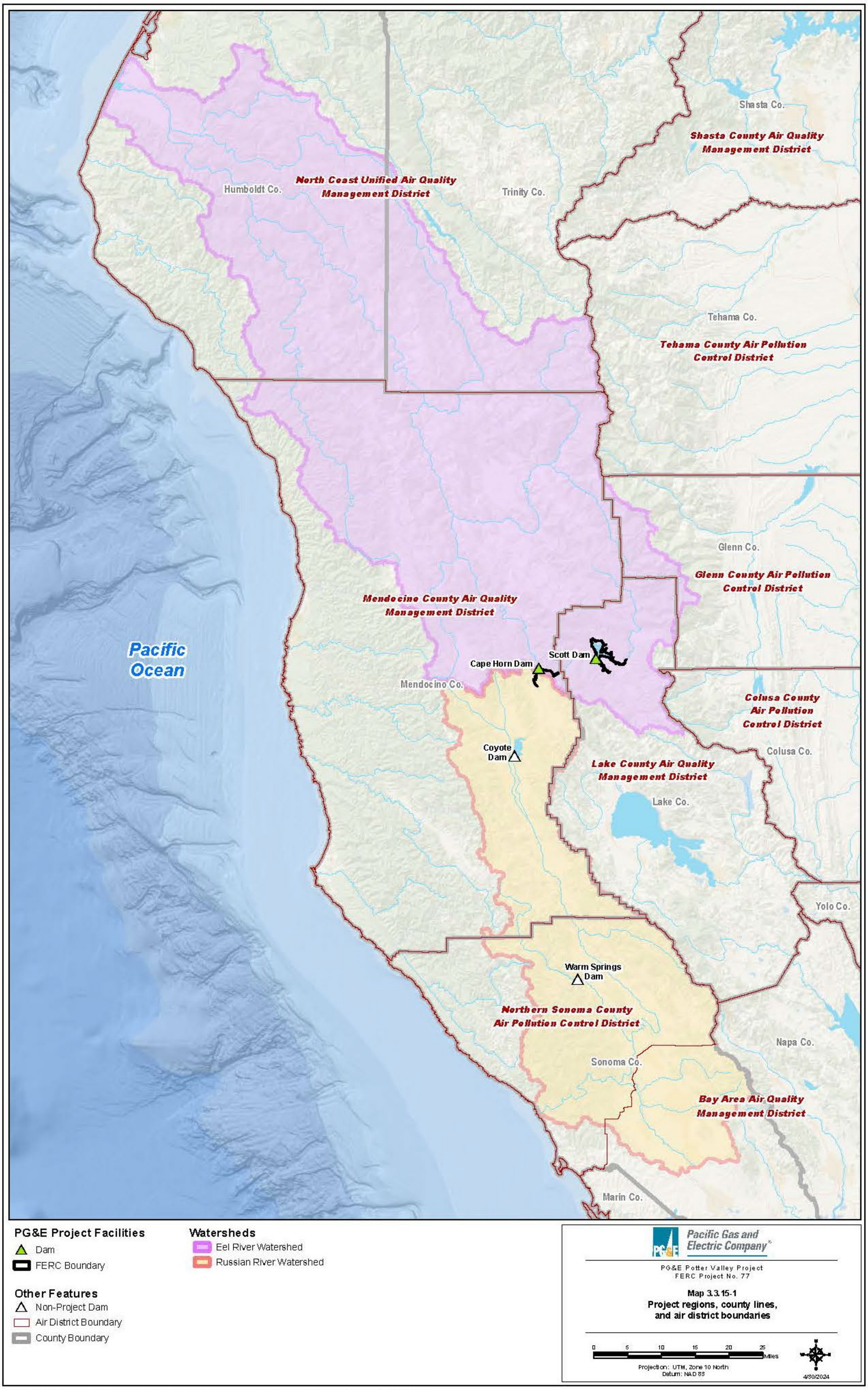
Clean Air Act. The federal Clean Air Act (CAA) of 1970 and the CAA Amendments of 1971 required the USEPA to establish National Ambient Air Quality Standards (NAAQS) for six common air pollutants, known as criteria pollutants, with individual states retaining the option to adopt more stringent standards or to include other specific pollutants. Criteria air pollutants are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (measured both in units of smaller than 2.5 microns in diameter [$PM_{2.5}$] and smaller than 10 microns in diameter [PM_{10}]), and lead (Pb).

NAAQS are the levels of air quality considered safe, with an adequate margin of safety, to protect the public health and welfare.

They are designed to protect "sensitive receptors," which includes people most susceptible to further respiratory distress such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise. Healthy adults can typically tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed. The state of California has adopted California Ambient Air Quality Standards (CAAQS) that are equal to or more stringent than the NAAQS and include pollutants for which national standards do not exist. Table 3.3.15-1 presents the applicable NAAQS and CAAQS.

Criteria Pollutants

- **Ozone (O_3).** The majority of ground-level O_3 is formed as a result of complex photochemical reactions in the atmosphere between reactive organic gases (ROGs), nitrogen oxides (NOx), and oxygen. ROGs and NOx are considered precursors to the formation of O_3, a highly reactive gas that can damage lung tissue and affect respiratory function. While O_3 in the lower atmosphere is considered a damaging air pollutant, O_3 in the upper atmosphere is beneficial, as it protects the Earth from harmful ultraviolet radiation (USEPA 2024a). ROG and NOx are both generated as byproducts of fossil fuel combustion.
- **Carbon Monoxide (CO).** CO is a colorless, odorless, poisonous gas produced by the incomplete combustion of fossil fuels. Elevated levels of CO can result in harmful health effects and may occur in areas with extensive traffic congestion and vehicle idling (USEPA 2024a).
- **Nitrogen Dioxide (NO_2).** NO_2 is a brownish, highly reactive gas primarily produced as a result of the burning of fossil fuels. NO_2 can also lead to the formation of O_3 in the lower atmosphere (USEPA 2024a).
- **Sulfur Dioxide (SO_2).** SO_2 is primarily emitted from the combustion of coal and oil. High concentrations of SO_2 can aggravate existing respiratory and cardiovascular diseases in asthmatics and others who suffer from emphysema or bronchitis (USEPA 2024a).
- **Particulate Matter (PM).** Airborne PM is not a single pollutant, but rather is a mixture of many chemical species, including small droplets of liquid; dry, solid fragments; and solid cores with liquid coatings. PM is defined by diameter for air quality regulatory purposes. PM_{10} is inhalable into the lungs and can induce adverse health effects. $PM_{2.5}$ is fine particulate matter and constitutes a portion of PM_{10}. Emissions from combustion of gasoline, oil, and wood produce much of the $PM_{2.5}$ pollution found in outdoor air. In addition, the combustion of diesel fuel generates diesel particulate matter (DPM), 90 percent of which would be categorized as $PM_{2.5}$. PM_{10} includes fugitive dust from construction sites, landfills and agriculture, wildfires and brush/waste burning, industrial sources, wind-blown dust from open lands, pollen, and fragments of bacteria (USEPA 2024a).



Map 3.3.15-1. Project regions, county lines, and air district boundaries.

This Page Intentionally Left Blank

Table 3.3.15-1. National and California Ambient Air Quality Standards.

Pollutant	Averaging Time	California Standards[1]	National Standards[2]	
			Primary	Secondary
Ozone (O_3)	8-hour	0.070 ppm (137 µg/m^3)	0.070 ppm (137 µg/m^3)	Same as Primary Standards
	1-hour	0.09 ppm (180 µg/m^3)	--	
Carbon monoxide (CO)	8-hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	--
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	
Nitrogen dioxide (NO_2)	Annual arithmetic mean	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as Primary Standard
	1-hour	0.18 ppm (339 µg/m^3)	100 ppb (188 µg/m^3)	
Sulfur dioxide (SO_2)	Annual arithmetic mean	--	0.030 ppm (80 µg/m^3)	--
	24-hour	0.04 ppm (105 µg/m^3)	0.14 ppm (80 µg/m^3)	--
	3-hour	--	--	0.5 ppm (1,300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	--	--
Respirable Particulate Matter Smaller than 10 Microns in Diameter (PM_{10})	Annual arithmetic mean	20 µg/m^3	--	Same as Primary Standards
	24-hour	50 µg/m^3	150 µg/m^3	
Respirable Particulate Matter Smaller than 2.5 Microns in Diameter ($PM_{2.5}$)[3]	Annual arithmetic mean	12 µg/m^3	9.0 µg/m^3	15 µg/m^3
	24-hour	No Separate Standard	35 µg/m^3	Same as Primary Standards
Sulfates	24-hour	25 µg/m^3	--	--
Lead (Pb)	30-day average	1.5 µg/m^3	--	--
	Calendar quarter	--	1.5 µg/m^3	Same as Primary Standard
	Rolling 3-month average	--	0.15 µg/m^3	

Pollutant	Averaging Time	California Standards[1]	National Standards[2]	
			Primary	Secondary
Hydrogen Sulfide (H_2S)	1-hour	0.03 ppm (42 µg/m^3)	--	--
Vinyl Chloride (chloroethene)	24-hour	0.01 ppm (26 µg/m^3)	--	--
Visibility Reducing Particles	8-hour	In 1989, the California Air Resources Board converted the general statewide 10-mile visibility standard to instrumental equivalent, which is "extinction of 0.23 per kilometer."	--	--

Source: CARB 2016

Notes: -- = no standard established
µg/m^3 = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter
ppm = parts per million

1. CO, SO_2 (1- and 24-hour), NO_2, O_3, PM_{10}, and visibility-reducing particles standards are not to be exceeded.
2. Not to be exceeded more than once a year except for annual standards.
3. On February 7, 2024, USEPA issued a pre-publication version of the Final Rule to lower the primary annual NAAQS for $PM_{2.5}$ from 12.0 µg/m^3 to 9.0 µg/m^3.

- **Lead (Pb).** Sources of Pb include pipes, fuel, and paint, although the use of Pb in these materials has declined dramatically in recent years. Historically, a main source of Pb was automobile emissions. Fetuses and children are most susceptible to Pb poisoning, which can result in heart disease and nervous system damage. Through regulations, the USEPA has gradually reduced the Pb content of gasoline, although Pb is still present in some airplane and helicopter fuels (USEPA 2024b).

Attainment Status

Pursuant to the federal CAA, the USEPA has developed classifications for air quality. An area is designated as being in “attainment” if it is compliant with an applicable NAAQS; “nonattainment” if the levels exceed a particular NAAQS for a given pollutant; or “maintenance” if monitored pollutants have improved under an approved USEPA plan. There may also be areas for which there are insufficient levels of monitoring data, and these may be designated as “unclassified.”

State Implementation Plan

A State Implementation Plan (SIP) is a collection of regulations and documents used by a state, territory, or local air district to implement, maintain, and enforce the NAAQS, show how a state will meet the NAAQS, and comply with the federal CAA. The CARB is the state agency for the State of California that has been delegated the authority to implement the SIP.

General Conformity Rule (40 CFR 51.850-860 and 40 CFR 93.150-160). Section 176(c) of the 1990 CAA Amendments contains the General Conformity Rule (40 CFR 51.850-860 and 40 CFR 93.150-160). The General Conformity Rule requires any federal agency responsible for an action in a nonattainment or maintenance area to determine that the action conforms to the applicable SIP. This means that federally supported or funded activities would not (1) cause or contribute to any new air quality standard violation; (2) increase the frequency or severity of any existing standard violation; or (3) delay the timely attainment of any standard, interim emission reduction, or other milestone.

For projects located in regions that are in attainment of the NAAQS, emissions of the pollutants that are in attainment are exempt from conformity analyses. The USEPA has developed thresholds for criteria pollutants; if a project emits criteria pollutants at a rate less than the thresholds, then the project is not expected to interfere with the applicable SIP. A detailed analysis, called a formal conformity determination, is required for any actions that exceed these thresholds.

3.3.15.4 Scott Dam Area

The Scott Dam Area includes Scott Dam, Lake Pillsbury, and the surrounding recreation facilities. As shown on Map 3.3.15-1, the Scott Dam Area is located in northern Lake County, which is within the jurisdiction of the LCAQMD. The LCAQMD is responsible for issuing permits for major stationary sources of emissions and for regularly monitoring air quality in the county. Lake County is in attainment for all NAAQS and CAAQS and, as a result, has not adopted an air quality management plan (LCAQMD 2024).

3.3.15.5 Cape Horn Dam Area

The Cape Horn Dam Area includes Cape Horn Dam and the Van Arsdale Reservoir. As shown on Map 3.3.15-1, this region is located within Mendocino County, which is within the jurisdiction of the MCAQMD. Specifically, the Cape Horn Dam Area is in the inland region surrounding the cities of Ukiah and Willits. This area is in attainment or unclassified for all NAAQS but is in non-attainment for the state PM_{10} standard.

The primary sources of PM_{10} emissions include wood combustion, fugitive dust from construction, and vehicle emissions (MCAQMD 2024). The MCAQMD has adopted a Particulate Matter Attainment Plan to achieve attainment of the PM_{10} CAAQS (MCAQMD 2005).

3.3.15.6 Eel River Watershed

The Eel River Watershed includes the Eel River from Scott Dam to the Pacific Ocean and its tributaries. The Eel River Watershed covers a large area in Lake County, Mendocino County, Glenn County, Humboldt County, and Trinity County. See Table 3.3.15-2 for a summary of the attainment status in each county included in the Eel River Watershed.

As noted previously for the Scott Dam Area discussion, air quality within Lake County is regulated by the LCAQMD, and the county is in attainment for all NAAQS and CAAQS. Similarly, as described for the Cape Horn Dam Area discussion, air quality within Mendocino County is regulated by the MCAQMD, and the county is in attainment or unclassified for all NAAQS but does not achieve attainment for the state PM_{10} standard.

Air quality in Glenn County is regulated by the Glenn County Air Pollution Control District (GCAPCD). Glenn County is in nonattainment for the state PM_{10} standard. Both Humboldt County and Trinity County are within the jurisdiction of the North Coast Unified Air Quality Management District (NCUAQMD). The NCUAQMD region is listed as attainment or unclassified for all NAAQS and CAAQS with the exception of the state 24-hour PM_{10} standard in Humboldt County only, which is in nonattainment.

3.3.15.7 Russian River Watershed

The Russian River Watershed includes the East Branch Russian River, Lake Mendocino, and the Russian River and extends within portions of Lake County, Mendocino County, and Sonoma County. See Table 3.3.15-2 for a summary of the attainment status in each county included in the Eel River Watershed.

As noted previously for the Scott Dam Area discussion, air quality within Lake County is regulated by the LCAQMD, and the county is in attainment for all NAAQS and CAAQS. Similarly, as described for the Cape Horn Dam Area discussion, air quality within Mendocino County is regulated by the MCAQMD, and the county is in attainment for all NAAQS, but does not achieve attainment for the state PM_{10} standard.

Table 3.3.15-2. Attainment status of each Project region.

Project Region	County	Air District	Attainment Status
Scott Dam Area	Lake County	LCAQMD	• Attainment for all NAAQS and CAAQS
Cape Horn Dam Area	Mendocino County	MCAQMD	• Non-attainment for PM_{10} CAAQS • Attainment or unclassified for NAAQS and all other CAAQS
Eel River Watershed	Lake County	LCAQMD	• Attainment for all NAAQS and CAAQS
	Mendocino County	MCAQMD	• Non-attainment for PM_{10} CAAQS • Attainment or unclassified for NAAQS and all other CAAQS
	Glenn County	GCAPCD	• Non-attainment for PM_{10} CAAQS • Attainment for NAAQS and all other CAAQS
	Humboldt County Trinity County	NCUAQMD	• Humboldt County is in non-attainment for PM_{10} CAAQS • Attainment or unclassified for NAAQS and all other CAAQS
Russian River Watershed	Lake County	LCAQMD	• Attainment for all NAAQS and CAAQS
	Mendocino County	MCAQMD	• Non-attainment for PM_{10} CAAQS • Attainment or unclassified for NAAQS and all other CAAQS
	Sonoma County	NoSoCo Air	• Attainment for all NAAQS and CAAQS
		BAAQMD	• Non-attainment for O_3, $PM_{2.5}$, and PM_{10} CAAQS • Non-attainment for O_3 and $PM_{2.5}$ NAAQS • Attainment or unclassified for all other NAAQS and CAAQS

Air quality within the northern portion of Sonoma County is regulated by the Northern Sonoma County Air Pollution Control District (NoSoCo Air), and the southern portion of Sonoma County is regulated by the BAAQMD. The NoSoCo Air region is in attainment of all NAAQS and CAAQS. The BAAQMD region is designated as nonattainment for state O_3, $PM_{2.5}$, and PM_{10} standards, as well as national O_3 and $PM_{2.5}$ standards. The 2017 Clean Air Plan is the BAAQMD's regional strategy for protecting public health and protecting the climate (BAAQMD 2024).

3.3.15.8 References

BAAQMD (Bay Area Air Quality Management District). 2024. Current plans. Available at: https://www.baaqmd.gov/plans-and-climate/air-quality-plans/current-plans. Accessed February 2024.

CARB (California Air Resources Board). 2016. Ambient air quality standards. Available at: https://ww2.arb.ca.gov/sites/default/files/2020-07/aaqs2.pdf. Accessed February 2024.

LCAQMD (Lake County Air Quality Management District). 2024. Quality of air affects quality of life. Available at: https://www.lcaqmd.net/about/. Accessed February 2024.

MCAQMD (Mendocino County Air Quality Management District). 2024. Air quality setting for environmental documents. Available at: https://www.co.mendocino.ca.us/aqmd/pdf_files/AQSetting.pdf. Accessed February 2024.

MCAQMD (Mendocino County Air Quality Management District). 2005. Particulate matter attainment plan. Available at: https://www.co.mendocino.ca.us/aqmd/pdf_files/Attainment%20Plan_DRAFT.pdf. Accessed February 2024.

USEPA (U.S. Environmental Protection Agency). 2024a. Criteria air pollutants. Available at: https://www.epa.gov/criteria-air-pollutants?msclkid=402121eaa62811ec9f3a5e32e281714a. Accessed February 2024.

USEPA (U.S. Environmental Protection Agency). 2024b. Lead. Available at: https://www.epa.gov/lead. Accessed February 2024.

USEPA (U.S. Environmental Protection Agency). 2024c. Reviewing National Ambient Air Quality Standards (NAAQS): scientific and technical information. Available at: https://www.epa.gov/naaqs. Accessed February 2024.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

ANSI	American National Standards Institute
Caltrans	California Department of Transportation
dB	decibel
dBA	A-weighted decibel
in/sec	inches per second
PG&E	Pacific Gas and Electric Company

PPV	peak particle velocities
Project	Potter Valley Hydroelectric Project
SPL	sound pressure level

3.3.16 Noise

3.3.16.1 Introduction

This section describes the noise setting in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project). In addition, this section provides background information on the fundamentals of noise and vibration analyses, relevant regulations, and the existing ambient noise environment in each of the four Study Regions: (1) Scott Dam Area, (2) Cape Horn Dam Area, (3) Eel River Watershed, and (4) Russian River Watershed. Potential environmental effects related to noise and vibration are addressed in Section 3.4.1.17.

3.3.16.2 Information Sources

The information presented in this section is primarily based on data from the following sources:

- American National Standards Institute's (ANSI's) *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound* (ANSI 2013);
- California Department of Transportation's (Caltrans') *Transportation Related Earthborne Vibrations* (Caltrans 2002);
- Caltrans' *Technical Noise Supplement Traffic Noise Analysis Protocol* (Caltrans 2013);
- Federal Transit Administration's *Transit Noise and Vibration Impact Assessment* (Federal Transit Administration 2006);
- Lake County's General Plan (Lake County 2008);
- Lake County's Code of Ordinances (Lake County 2012); and
- Mendocino County's General Plan Update Environmental Impact Report (County of Mendocino 2008).

3.3.16.3 Background Information

Fundamentals of Noise

Sound is mechanical energy transmitted by pressure waves over a medium such as air or water, while noise is generally defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise pollution can interfere with human and wildlife activities, evaluation of noise is necessary when considering the environmental impacts of a project. Potential impacts to wildlife are discussed in Section 3.4.1.6.

Sound requires a source, a transmission path, and a receiver, and is characterized by various parameters including the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level (SPL) is the most common descriptor used to characterize the volume of an existing sound level.

The decibel (dB) scale is a logarithmic scale used to quantify sound intensity. However, it does not accurately describe how sound intensity is perceived by human hearing since the perceived loudness of sound is dependent upon many factors, including SPL and frequency content. The human ear is not equally sensitive to all frequencies in the entire sound spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called A-weighting, written as dBA and referred to as A-weighted decibels. There is a strong correlation between A-weighted sound levels and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. Table 3.3.16-1 summarizes typical A-weighted sound levels for different common noise sources.

Table 3.3.16-1. Typical A-weighted sound levels.

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	160	Instant perforation of eardrum*
	150	
Military jet takeoff*	140	
	130	Threshold of pain*
	120	
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
Noisy urban area, daytime	80	Garbage disposal at 3 feet
Gas lawnmower, 100 feet		
Commercial area	70	Vacuum cleaner at 10 feet
Heavy traffic at 300 feet		Normal speech at 3 feet
	60	
Quiet urban daytime		Large business office
	50	Dishwasher in next room
Quiet urban nighttime		
Quiet suburban nighttime	40	Theater, large conference room (background)
Quiet rural nighttime	30	Library
		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
		Threshold of human hearing*
	0	

Source: Caltrans 2013, 2024
Note: The noise level for items identified with an asterisk (*) is not A-weighted.

Human hearing, voices, and interior noise levels are typically in the range of 50 to 70 dBA (Caltrans 2013). With respect to how humans perceive changes in noise levels, a 1 dBA increase is imperceptible, a 3 dBA increase is barely perceptible, a 5 dBA increase is clearly noticeable, and a 10 dBA increase is subjectively perceived as approximately twice as loud (Caltrans 2013). These perceptions to changes in noise levels were developed by Caltrans on the basis of test subjects' reactions to changes in the levels of steady-state pure tones, or broadband noise, and to changes in levels of a given noise source.

For a point noise source, such as demolition equipment, sound attenuates at a rate of 6 dB per doubling of distance. For a line noise source, such as free-flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance. Atmospheric conditions including wind, temperature gradients, and humidity, can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface, such as grass, attenuates at a slightly greater rate than sound that travels over a hard surface, such as pavement. For example, music from a portable speaker may be heard clearly by a receptor 100 feet away when standing in an empty parking lot, whereas music played at the same volume may be indistinguishable by a receptor 100 feet away when standing in a heavily vegetated and wooded area. The increased attenuation provided by absorptive surfaces is typically in the range of 1 to 2 dB per doubling of distance. Barriers, such as buildings and topography that block the line of sight between a source and receiver, also increase the attenuation of sound over distance (Caltrans 2013). In other words, sound levels that reach the receiver are reduced when buildings or other barriers are located between the source and receiver.

Demolition activities associated with the Project would generate noise which would vary depending on the type of equipment used and the proximity of receptors. Table 3.3.16-2 presents typical noise levels generated from various types of construction equipment as measured 50 feet away.

Table 3.3.16-2. Typical noise levels from construction equipment.

Type of Equipment	Typical Noise Level at 50 feet from Source (dBA)
Roller	74
Concrete vibrator	76
Saw	76
Backhoe	80
Air compressor	81
Compactor	82
Ballast tamper	83
Crane, mobile	83
Dozer	85
Grader	85

Type of Equipment	Typical Noise Level at 50 feet from Source (dBA)
Loader	85
Jack hammer	88
Scraper	89

Source: Federal Transit Administration 2006

Fundamentals of Vibration

Similar to noise, vibration also involves a source, a transmission path, and a receiver. However, while noise is generally considered to be pressure waves transmitted through air, vibration is generally transmitted through the ground or structures. A person's perception of vibration depends on their individual sensitivity to vibration, as well as the amplitude and frequency of the source, and the response of the system that is vibrating (i.e., vibrational resonance).

Vibration is measured in terms of acceleration, velocity, or displacement. This document considers vibration in terms of peak particle velocities (PPV) in inches per second (in/sec). Table 3.3.16-3 presents the vibration levels and the associated effects on humans and structures.

Table 3.3.16-3. Effects of continuous vibration on people and buildings.

Peak Particle Velocity (in/sec)	Effect on Humans	Effect on Buildings
0.006–0.019	Threshold of perception	Unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibrations to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of architectural damage to standard buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is risk of architectural damage to normal dwellings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at greater levels than normally expected from traffic; would cause architectural damage and possibly minor structural damage

Source: Caltrans 2002

Demolition activities associated with the Project would generate ground borne vibration from the operation of heavy equipment. As with noise, vibration levels would vary depending on the type of equipment used and the distance to receptors. Table 3.3.16-4 presents typical vibration levels from various types of construction equipment as measured from 25 ft. away.

Table 3.3.16-4. Typical vibration levels from construction equipment.

Type of Equipment	Typical Vibration Level at 25 feet from Source (PPV in/sec)
Small bulldozer	0.003
Jack hammer	0.035
Loaded truck	0.076
Hoe ram	0.089
Large bulldozer	0.089
Vibratory roller	0.21
Impact pile driver	0.644

Source: Federal Transit Administration 2006

Applicable Regulations

No state or federal regulations apply to community noise. Instead, noise is managed at a local level, typically in county general plans. While four Study Regions have been identified, the noise analysis will primarily address noise effects in two Study Regions: the Scott Dam Area Study Region and the Cape Horn Dam Area Study Region. In particular, the noise analysis will focus on potential impacts to receptors that are located closest to planned Project actions near Scott Dam, Cape Horn Dam, along the Cape Horn Dam pumping infrastructure and powerhouse, and along haul truck routes that would be used by Project vehicles. The following provides a discussion of the applicable regulations to limit noise exposure and groundborne vibration at sensitive land uses. Planned Project actions that are expected to generate noise are located in Lake and Mendocino counties; therefore, the Lake County and Mendocino County regulations are included below.

Lake County

The Noise Element of the Lake County General Plan includes land use compatibility guidelines that establish maximum allowable noise exposure levels for various land use categories. For single-family residential uses, the normally acceptable community noise exposure level is up to 55 dBA. In addition, General Plan Policy N-1.7 requires that contractors implement noise reduction measures when construction occurs within 500 ft. of sensitive receptors (Lake County 2008). Lake County does not have a noise ordinance; however, loud noises can be regulated under County Code Chapter 13, Nuisances (Lake County 2012).

Mendocino County

The Noise Element of the Mendocino County General Plan includes land use compatibility guidelines that establish maximum noise exposure level for various land use categories. For single-family residential uses, the normally acceptable community noise exposure level is up to 60 dBA. Similarly, the county's code of ordinances identifies exterior noise limit standards for certain zoning districts. For rural residential areas, nighttime noise is not to exceed 40 dBA for more than 30 minutes in any hour, and daytime noise is not to exceed 50 dBA for more than

30 minutes in any hour (County of Mendocino 2008). Mendocino County does not have a noise ordinance or established construction hours.

Ambient Noise Environment

The existing ambient noise environment in an area is characterized by the area's general level of development. Areas that are not urbanized are typically relatively quiet, although may experience intermittent noise associated with agricultural and recreational equipment. Areas that are more urbanized are generally noisier as a result of roadway traffic, industrial activities, and other human activities. Ambient noise is often diurnal in character and diminishes at night. A summary of the primary contributors to the ambient noise environment is included for each Study Region below.

Sensitive Receptors

Some land uses are more tolerant of noise than others. Schools, hospitals, churches, residences, and some recreational activities (bird watching, hiking, etc.) are considered to be more sensitive to noise intrusion than are commercial or industrial activities. The nearest sensitive receptors within each Project Study Region are identified in Map 3.3.16-1 and Map 3.3.16-2 and summarized below.

3.3.16.4 Scott Dam Area

The Scott Dam Area Study Region includes Scott Dam, southwestern Lake Pillsbury, and the surrounding area (see Map 3.3.16-1). The Scott Dam Area Study Region is rural in nature and is classified as Category 6, Very Quiet, Sparse Suburban, or Rural Residential Areas, per the ANSI classification system. According to ANSI, rural residential areas (Category 6), such as the Scott Dam Area Study Region, experience a typical daytime noise level of 40 dBA (ANSI 2013).

The ambient noise environment is primarily defined by vehicle traffic on area roadways, boat traffic on Lake Pillsbury, and water flows over Scott Dam. The nearest major roadway in the vicinity of the Project demolition area is Elk Mountain Road/County Road 301. In addition, aircraft flyovers associated with the Gravelly Valley Airport, north of Lake Pillsbury, contribute to intermittent increases in ambient noise. Specifically, the Gravelly Valley Airport serves an average of 83 takeoffs and landings per month (AirNav 2024). The runway is located approximately 2.4 miles north of Scott Dam.

The sensitive noise receptors within the Scott Dam Area Study Region include scattered rural residences to the south and guests at the Lake Pillsbury Resort and surrounding campsites to the north. The Lake Pillsbury Resort is located approximately 4,400 ft. (0.8 mi.) north of Scott Dam. The nearest residence to the demolition area is located approximately 1,400 ft. (0.26 mi.) southwest of Scott Dam (see Map 3.3.16-1). Several roads, including County Road 301, Kapranos Road, Elk Mountain Road, Rice Fork Road, Gravel Cutoff Road, Logging Road (M8), Gage E2 Access Road, Scott Dam Road, Upper Scott Dam Access Road, and roads associated with the resort and residences, are located in the Scott Dam Area Study Region.

3.3.16.5 Cape Horn Dam Area

The Cape Horn Dam Area Study Region includes Cape Horn Dam and Van Arsdale Reservoir (see Map 3.3.16-2). The Cape Horn Dam Area Study Region is rural in nature and is classified as Category 5, Quiet Residential Areas, per the ANSI classification system (ANSI 2013). According to ANSI, quiet residential areas (Category 5), such as the Cape Horn Dam Area Study Region, experience a typical daytime noise level of 45 dBA (ANSI 2013).

The ambient noise environment is primarily defined by vehicle traffic on area roadways, noise from farm animals, agriculture/landscaping maintenance equipment noise, and noise associated with the Cape Horn Dam spillway. The primary roadways in the vicinity include Van Arsdale Road and Ridgeway Highway. The Potter Valley Powerhouse is currently inactive. The associated Potter Valley Powerhouse Helicopter Landing Site is used primarily for emergencies, 1 to 3 times per year. As a result, noise from the powerhouse and associated Potter Valley Powerhouse Helicopter Landing Site does not contribute to the existing ambient noise environment.

The sensitive noise receptors within the Cape Horn Dam Area Study Region include rural residences along Van Arsdale Road and Ridgeway Highway. The nearest residence to Cape Horn Dam is located approximately 1,000 ft. to the east of the dam (see Map 3.3.16-2). Several roads are located in the Cape Horn Dam Area Study Region, including roads associated with the residences, Ridgeway Highway, Logging Road (M8), Van Arsdale Road, Eel River Road, Cutoff Road, Cape Horn Dam East Access Road, Intake Access Road, Penstock, Pipeline and Butterfly Valve House Access Road, and Powerhouse Main Access Road.

3.3.16.6 Eel River Watershed

The Eel River Watershed covers a large area of Lake County, Mendocino County, Glenn County, Humboldt County, and Trinity County (see Map 2-3). This discussion focuses on the southernmost portion of the Eel River Watershed (i.e., Southern Eel River Watershed Study Region) where the Project is located, and encompasses the entire Scott Dam Area Study Region and the northeastern portion of the Cape Horn Dam Area Study Region.

The Southern Eel River Watershed Study Region is heavily forested and rural in nature. The ambient noise environment is primarily defined by vehicle traffic on area roadways, with higher ambient noise levels in urbanized regions. The most significant roadway in the Eel River Watershed is Highway 101; however, Highway 101 does not extend through the Southern Eel River Watershed Study Region. The ambient noise environment varies regionally, but generally would be described as a rural residential area (Category 6), with a typical daytime noise level of 40 dBA (ANSI 2013).

Sections 3.3.16.3 and 3.3.16.4 discuss the relevant sensitive receptors in the areas closest to Project facilities. See Table 3.3.16-1 for a summary of sensitive receptors in all Study Regions.

3.3.16.7 Russian River Watershed

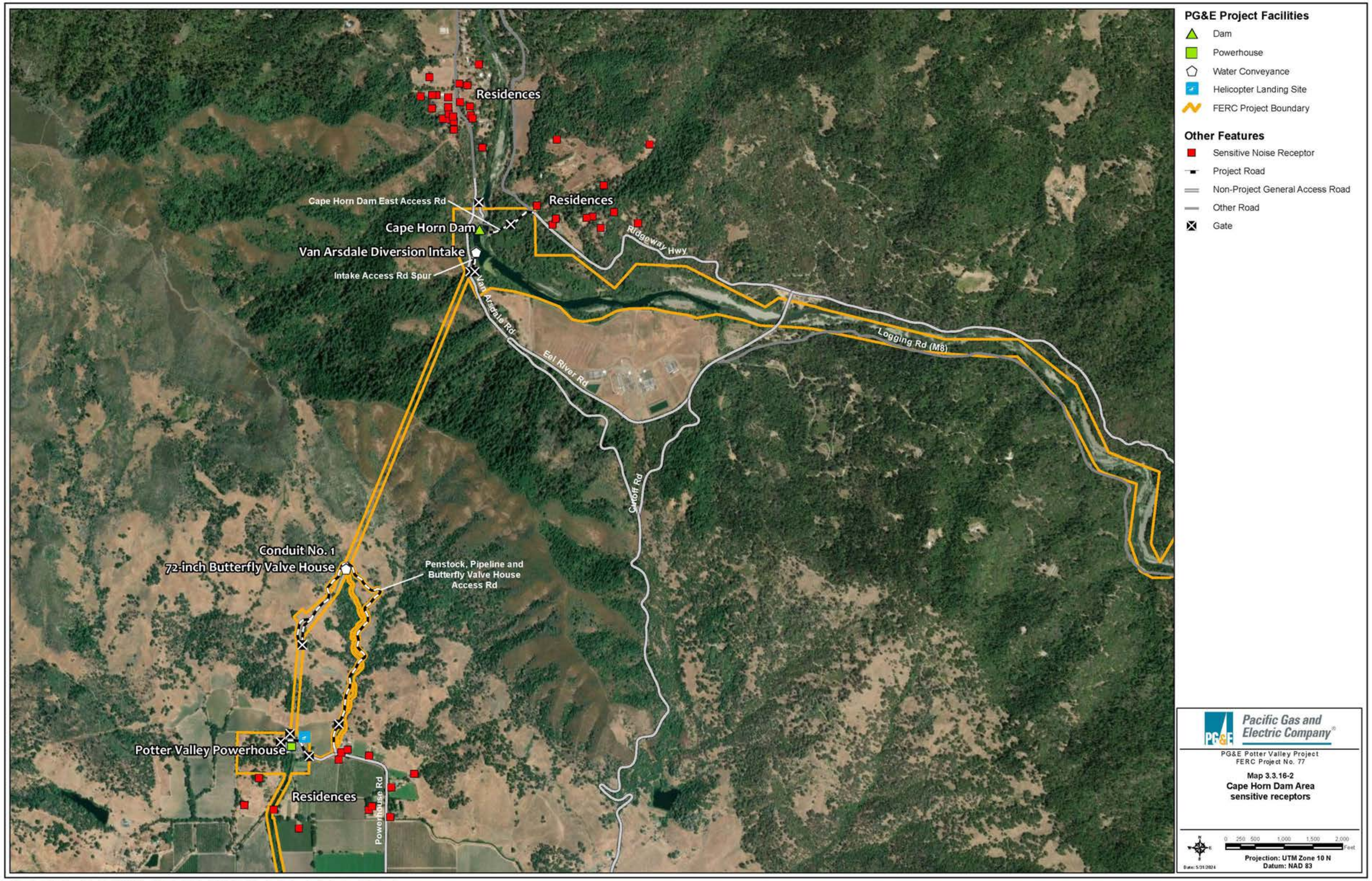
The Russian River Watershed includes the East Branch Russian River, Lake Mendocino, and the Russian River, and extends within portions of Lake County, Mendocino County, and Sonoma County (see Map 2-3). This discussion focuses on the northernmost portion of the Russian River Watershed (i.e., Northern Russian River Watershed Study Region) where the Project is located. The Study Region encompasses the southwestern portion of the Cape Horn Dam Area Study Region.

The Northern Russian River Watershed Study Region is heavily forested and rural in nature. The ambient noise environment is primarily defined by vehicle traffic on area roadways, with higher ambient noise levels in more developed regions including, but not limited to, the community of Potter Valley. The most significant roadways in the Russian River Watershed are Highway 101 and Highway 20; however, neither roadway extends through the Northern Russian River Watershed Study Region. The ambient noise environment varies regionally, but generally would be described as a quiet residential area (Category 5), with a typical daytime noise level of 45 dBA (ANSI 2013).

Section 3.3.16.4 discusses the relevant sensitive receptors in the areas closest to Project facilities. See Table 3.3.16-1 for a summary of sensitive receptors in all Study Regions.

Map 3.3.16-1. Scott Dam Area Study Region sensitive receptors.

This Page Intentionally Left Blank



Map 3.3.16-2. Cape Horn Dam Area Study Region sensitive receptors.

This Page Intentionally Left Blank

Table 3.3.16-5. Summary of existing noise environment and potential sensitive receptor locations for each Study Region.

Study Region	Local Regulatory Authority	Typical Ambient Noise Level	Ambient Noise Environment Characteristics	List of Sensitive Receptors
Scott Dam Area Study Region	Lake County	40 dBA	• Vehicle traffic on area roadways • Boat traffic on Lake Pillsbury • Water flows over Scott Dam	• Scattered rural residences. The nearest residence to Scott Dam is located approximately 1,400 ft. southwest of the dam. • Guests at the Lake Pillsbury Resort and surrounding campsites. The Lake Pillsbury Resort is located approximately 4,400 ft. north of Scott Dam. • Residences along roads in the Scott Dam Area Study Region, and access routes to the dam area.
Cape Horn Dam Area Study Region	Mendocino County	45 dBA	• Vehicle traffic on area roadways • Noise from farm animals • Agriculture/landscaping maintenance equipment noise • Noise associated with the Cape Horn Dam spillway	• Rural residences along Van Arsdale Road and Ridgeway Highway. The nearest residence to Cape Horn Dam is located approximately 1,000 ft. east of the dam. • Residences along roads in the Cape Horn Dam Area Study Region and access routes to the dam area.
Southern Eel River Watershed Study Region	Lake County and Mendocino County	40 dBA	• Vehicle traffic on area roadways • Boat traffic on Lake Pillsbury • Water flows over Scott Dam • Noise from farm animals • Agriculture/landscaping maintenance equipment noise • Noise associated with the Cape Horn Dam spillway	• Scattered rural residences. • Guests at the Lake Pillsbury Resort and surrounding campsites. • Residences along Project access routes.
Northern Russian River Watershed Study Region	Mendocino County	45 dBA	• Vehicle traffic on area roadways • Noise from farm animals • Agriculture/landscaping maintenance equipment noise	• Rural residences north of Potter Valley. • Residences along Project access routes.

3.3.16.8 References

AirNav. 2024. 1Q5 Gravelly Valley Airport, Upper Lake, California, USA. Available at: http://airnav.com/airport/1q5. Accessed April 2024.

ANSI (American National Standards Institute). 2013. American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present.

Caltrans (California Department of Transportation). 2013. Technical Noise Supplement Traffic Noise Analysis Protocol. Available at: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf. Accessed April 2024.

Caltrans (California Department of Transportation). 2024. Typical Noise Levels, Intensity and the Decibel Scale. Available at: https://dot.ca.gov/programs/maintenance/pavement/noise-levels. Accessed April 2024.

Caltrans (California Department of Transportation). 2002. Transportation Related Earthborne Vibrations. Available at: http://www.vibrationdata.com/tutorials_alt/caltrans_earth.pdf. Accessed April 2024.

County of Mendocino. 2008. General Plan Update Environmental Impact Report, 4.10, Noise. Available at: https://www.mendocinocounty.gov/home/showpublisheddocument/6416/636277241337230000. Accessed April 2024.

Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment. Available at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf . Accessed April 2024.

Lake County. 2012. Lake County, California – Code of Ordinances, Chapter 13 – Nuisances, Article I – Abatement of Nuisances. Available at: https://library.municode.com/ca/lake_county/codes/code_of_ordinances?nodeId=COOR_CH13NU_ARTIABNU. Accessed April 2024.

Lake County. 2008. General Plan, Chapter 8, Noise. Available at: https://www.lakecountyca.gov/DocumentCenter/View/1639/Chapter-8---Noise-PDF. Accessed April 2024.

TABLE OF CONTENTS

List of Maps

List of Acronyms

2022 RTP	Regional Transportation Plan and Active Transportation Plan
Caltrans	California Department of Transportation
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
ft.	feet
GHG	greenhouse gas
Lake APC	Lake Area Planning Council
LOS	level of service
MCOG	Mendocino Council of Governments
mi.	mile(s)
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
SB	Senate Bill
USDOT	United States Department of Transportation
USFS	United States Forest Service
VMT	vehicle miles traveled

3.3.17 Traffic

3.3.17.1 Introduction

This section describes the transportation setting in the vicinity of Pacific Gas and Electric Company's (PG&E's) Potter Valley Hydroelectric Project (Project), organized by each of the four Project regions: (1) Scott Dam Area, (2) Cape Horn Dam Area, (3) Eel River Watershed, and (4) Russian River Watershed. The Transportation Study Area includes the Project area and it's connected transportation system, including roads and trails. Roads and trails used almost exclusively by PG&E for routine operation and maintenance of the Project are referred to as Project roads and trails. County and U.S. Forest Service (USFS) roads open to the public with multiple uses are not designated as Project roads. Potential environmental effects related to transportation are addressed in Section 3.4.1.18.

Transportation patterns within the overall Project area resemble those found in lightly populated rural communities in northern California. The volume of traffic is greater near larger communities outside of the Project area. Predominant use of the rural roads in the area are by residents; recreational users; and agricultural and commodity trucks. Several paved and unpaved secondary roads provide access to the Project facilities, as summarized for each Project region below and depicted in Map 3.3.17-1, Map 3.3.17-2, and Map 3.3.17-3.

3.3.17.2 Information Sources

The information presented in this section is primarily based on data from the following:

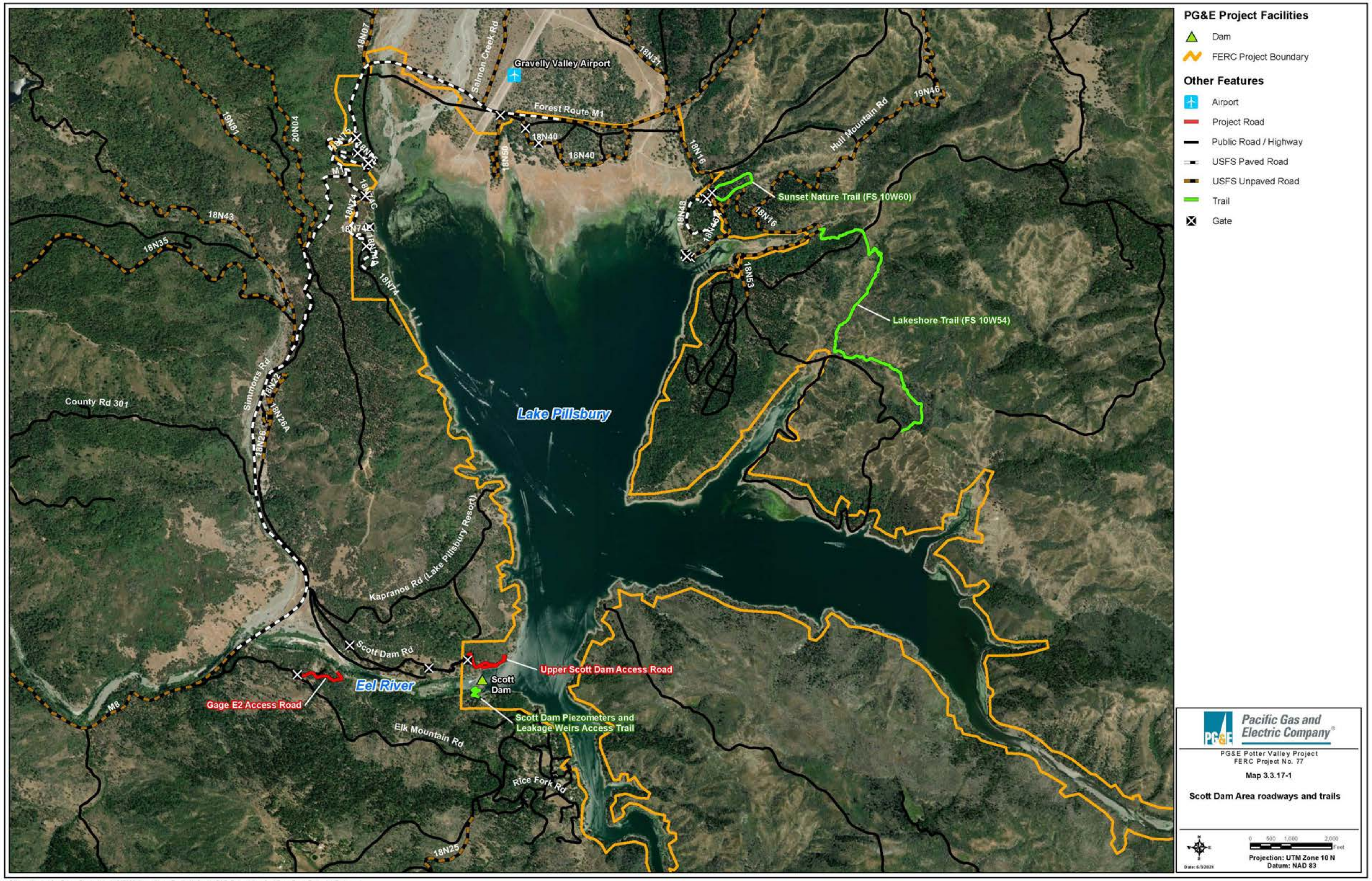
- Lake County General Plan (Lake County 2008);
- Mendocino County General Plan (Mendocino County 2020); and
- USFS Maps of Mendocino National Forest (USFS 2024).

3.3.17.3 Background Information

Applicable Regulations

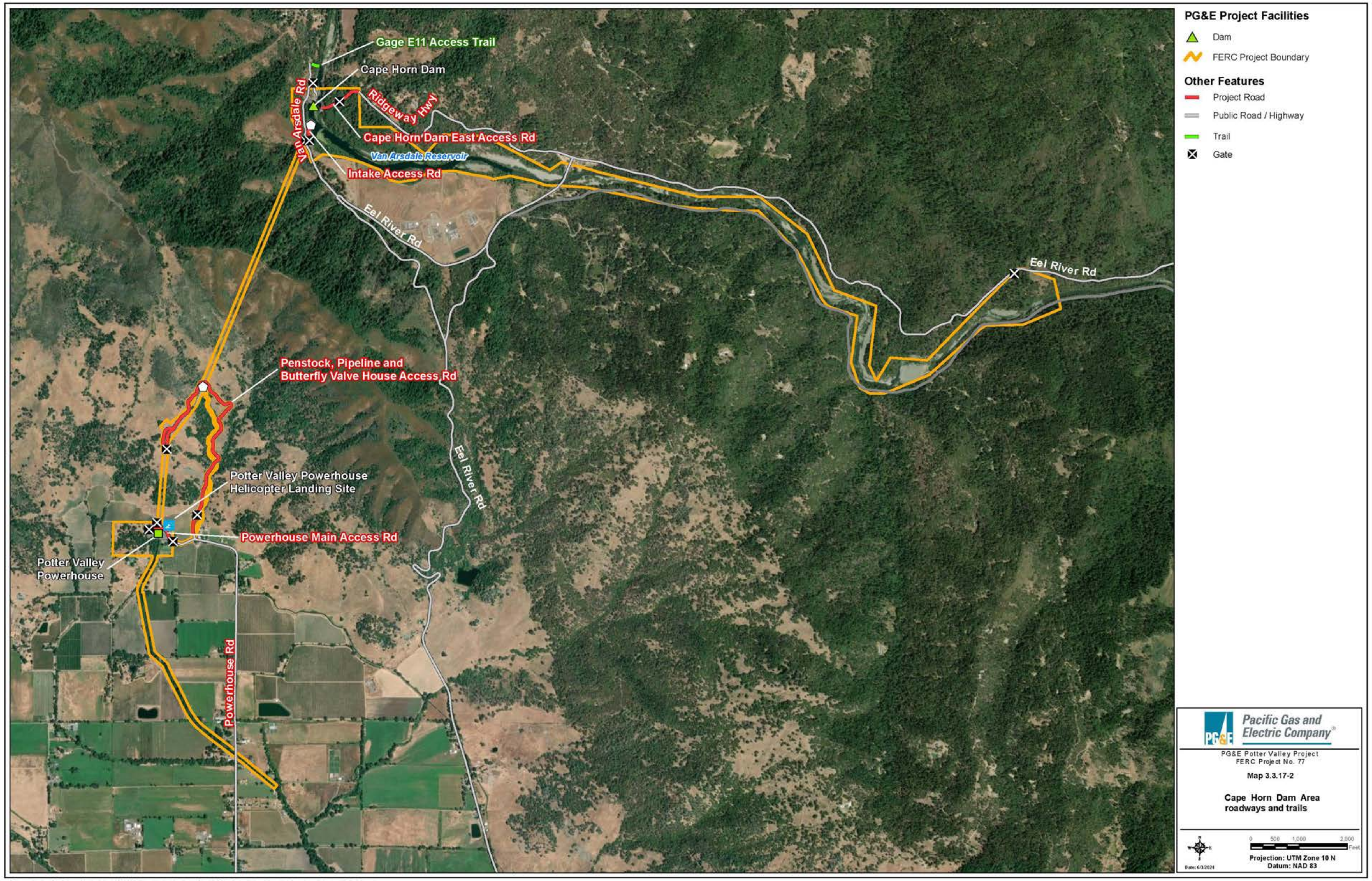
The traffic analysis focuses on potential impacts to transportation networks that are located closest to planned Project actions (i.e., along roadways that provide access to Scott Dam, Cape Horn Dam, the Cape Horn Dam pumping infrastructure and powerhouse, and along haul truck routes that could be used by Project vehicles). Planned Project actions that may affect the transportation network are located in Lake and Mendocino counties; therefore, the applicable Lake County and Mendocino County regulations are included below.

This Page Intentionally Left Blank



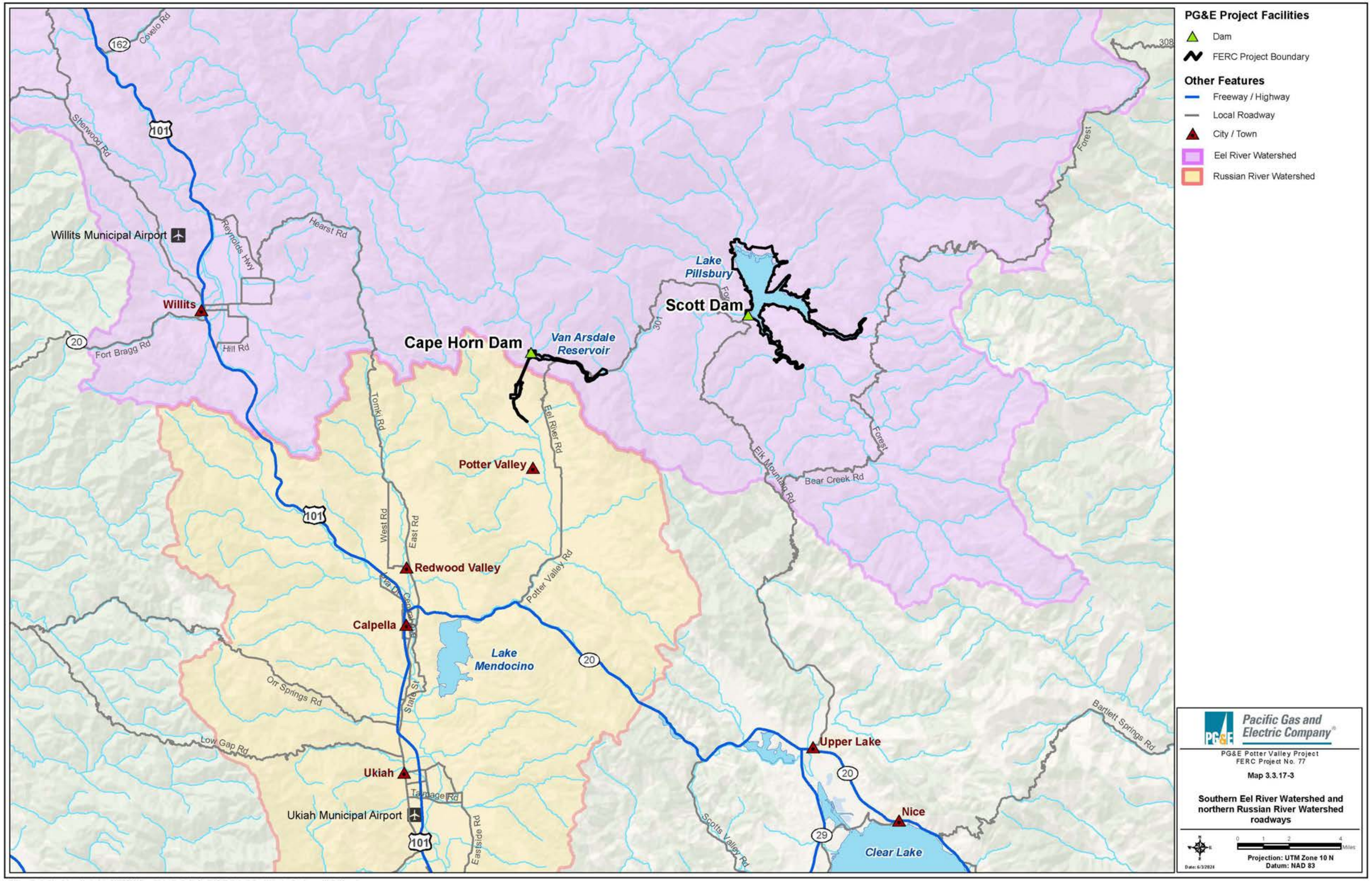
Map 3.3.17-1. Scott Dam Area roadways and trails.

This Page Intentionally Left Blank



Map 3.3.17-2. **Cape Horn Dam Area roadways and trails.**

This Page Intentionally Left Blank



Map 3.3.17-3. Southern Eel River Watershed and northern Russian River Watershed roadways.

This Page Intentionally Left Blank

Federal

U.S. Department of Transportation

The U.S. Department of Transportation (USDOT) is the federal agency that oversees transportation infrastructure across the country and addresses several modes of transportation, including aviation, automobiles, rail, and others. The Federal Highway Administration (FHWA), created in 1966, is the agency within USDOT that specializes in highway transportation. FHWA provides stewardship over the construction, maintenance, and preservation of national highways, bridges, and tunnels and establishes the regulations with which the California Department of Transportation (Caltrans) must comply. Highway 101 and Highway 20, which extend through portions of the Project area (Map 3.3.17-3), would be subject to USDOT/FHWA regulations.

State

California Department of Transportation

Caltrans is responsible for planning, designing, constructing, and maintaining all state-owned and -operated roadways in the Project area. In addition, Caltrans is the agency that implements regulations established by FHWA. Any improvements or modifications to the state highway system must be approved by Caltrans. Caltrans has regulatory authority over Highway 101, which extends north/south through both the Eel River and Russian River watersheds, as well as Highway 20, which travels generally east/west through a portion of the Russian River Watershed.

Senate Bill 743

On September 27, 2013, Senate Bill (SB) 743 was signed into law. The legislature found that with the adoption of the Sustainable Communities and Climate Protection Act of 2008 (SB 375), the State of California had signaled its commitment to encourage land use and transportation planning decisions and investments that reduce vehicle miles traveled (VMT) and thereby contribute to the reduction of greenhouse gas (GHG) emissions, as required by the California Global Warming Solutions Act of 2006 (Assembly Bill 32). Generally, SB 743 moves away from using delay-based level of service[1] (LOS) as the metric for identifying a significant impact and instead uses VMT. The new criteria “shall promote the reduction of GHG emissions, the development of multimodal transportation networks, and a diversity of land uses” (PRC Section 21099(b)(1)). Consistent with SB 743, the traffic analysis considers VMT when determining potential impacts associated with the Project.

[1] LOS is a qualitative metric that is used to measure the performance of roadways and is based primarily on levels of vehicle congestion. LOS categories range from A to F, with A describing free-flowing vehicle traffic and F describing unacceptable congestion/stop-and-go traffic.

Regional

Lake County

The Lake Area Planning Council (Lake APC) is the transportation planning agency for Lake County. The Lake APC has developed several regional plans that are applicable to the Project area, including the Regional Bikeway Plan (Lake APC 2011), Lake County Active Transportation Plan (Lake APC 2016), Vehicle Miles Traveled Regional Baseline Study (Lake APC 2020), and Regional Transportation Plan/Active Transportation Plan (Lake APC 2022).

The Transportation and Circulation Element of the Lake County General Plan also include goals and policies that may be applicable to the Project (Lake County 2008). The relevant policies are listed below:

- **Policy T-1.8 Level of Service:** County maintained roadways should be improved and maintained to provide an adequate peak period Level of Service (LOS) of “C” or better for existing and anticipated traffic volumes if roadway upgrades are feasible, such as roadway widening, addition of lanes via re-striping, and other safety and operational improvements. The County shall allow a limited number of County roadway segments to operate at a level of service of “E” or better where improving the segments to LOS C are deemed infeasible due to cost, negative community and/or environmental impacts, and/or constructability issues. This “E” level of service for certain roadways shall not include any State Highway unless approved by Caltrans.
- **Policy T-1.9. Truck Routes.** To reduce heavy truck traffic in residential areas and near noise sensitive land uses, the County shall ensure truck routes are designated in a manner such that traffic noise impacts are minimized.
- **Policy T-1.10. Construction Methods.** The County shall utilize road construction methods that seek to reduce air, water, and noise pollution associated with road and highway development.

Mendocino County

The Mendocino Council of Governments (MCOG) is the regional transportation planning agency for the Mendocino County region and has prepared a Regional Transportation Plan and Active Transportation Plan (2022 RTP) that was adopted in 2022. The 2022 RTP identified several short-range and long-range improvements to the roadway system and includes information on active, public, aviation, maritime, rail, and tribal transportation systems (MCOG 2022).

The Development Element of the Mendocino County General Plan includes policies related to transportation, roadway systems, and evacuation (Mendocino County 2020). The policies that may be applicable to the Project are listed below:

- **Policy DE-128:** Ensure that transportation infrastructure accommodates the safety and mobility of motorists, pedestrians, bicyclists, and persons in wheelchairs.

- **Action Item DE-128.2:** Develop and implement standards to ensure that roadways and other transportation infrastructure are restored to a safe condition after repair work, utility installation, or other activity.
- **Policy DE-130:** The County will coordinate with state and local agencies to ensure that transportation plans, standards, and improvements are consistent and compatible across jurisdictional lines.
- **Policy DE-133:** Consider community objectives and emergency evacuation constraints in prioritizing transportation improvements funding.
- **Policy DE-138:** The County supports the use of traffic calming techniques[2], where appropriate, to improve safety for motorists, bicyclists, pedestrians, and others. Special attention will be given to safety on roadways, which provide access for children to school.
- **Policy DE-139:** Support the construction or improvement of secondary neighborhood routes to alleviate congestion of the arterials and ensure effective evacuation access.
- **Policy DE-141:** Require all new development, redevelopment, or major renovation applying for discretionary approval[3] to comply with Cal Fire [California Department of Forestry and Fire Protection] requirements regarding ingress/egress issues to facilitate effective evacuation.

3.3.17.4 Scott Dam Area

The Scott Dam Area includes Scott Dam, Lake Pillsbury, and the surrounding recreation facilities. The Project facilities in the Scott Dam Area are in a relatively remote area with limited road access (Map 3.3.17-1). Scott Dam is accessible by vehicle year-round, although public access across the crest of Scott Dam is not allowed. There are locked gates to prohibit unauthorized vehicle access to the roads that lead to the dam facilities. Unauthorized access to the dam is restricted by locked steel gates located on both abutments of the dam. A safety barrier consisting of a floating plastic buoy boom has been placed to restrict boating and swimming near the dam.

The public has access to recreation facilities within the Scott Dam Area. Lake Pillsbury can be accessed from the south via Elk Mountain Road/County Road 301, from the west via Eel River Road/Elk Mountain Road, and from the northeast via Forest Service Road M6. The reservoir is also accessible from the north via a dirt road called Hull Mountain Road and other designated dirt roads that are part of the USFS transportation system. Hull Mountain Road is only open seasonally, from September through mid-May (USFS 2024). There are no marked bicycle facilities in the area.

---

[2] Traffic calming techniques refer to any measure or device that improves safety for motorists, cyclists, and pedestrians. These include, but are not limited to, full or half road closures, speed bumps, speed tables, traffic circles, raised intersections, and others.

[3] Discretionary approval refers to the process in which a public agency must exercise judgement to approve or deny a project. The Project will require discretionary approval from FERC, as well as any other public agencies involved in the Project (e.g., U.S. Army Corps of Engineers, USFS).

Roadways

The roadways that provide access to Scott Dam are described below and shown in Map 3.3.17-1:

- **Elk Mountain Road/County Road 301:** Elk Mountain Road is a public road that extends throughout Lake County, terminating in the south in the community of Upper Lake just north of Clearlake, along the western boundary of Lake Pillsbury, and to the west into Mendocino County, where the roadway is renamed Eel River Road. In the Project vicinity, Elk Mountain Road is a paved, two-lane roadway without lane markers or shoulders.
- **Kapranos Road:** Kapranos Road is a small and winding public roadway that connects Elk Mountain Road in the west to Lake Pillsbury Resort at the eastern terminus. Kapranos Road is unpaved and appears to accommodate two lanes of traffic.
- **Gage E2 Access Road:** Gage E2 Access Road is a narrow, unpaved private road off of Elk Mountain Road that terminates at the southern shore of the Eel River, west of Scott Dam. This private access road includes a security gate at the entrance and is a Project road that is exclusively used by PG&E.
- **Scott Dam Road:** Scott Dam Road is an unpaved, one-way road that connects Elk Mountain Road in the northwest, south of Kapranos Road, to the north side of Scott Dam. Scott Dam is accessible to the public for approximately 0.25 mile (mi.), after which access is limited by a series of security gates. This is a Project road that is exclusively used by PG&E.
- **Upper Scott Dam Access Road:** Upper Scott Dam Access Road refers to the unpaved eastern portion of Scott Dam Road and provides access to the northern side of Scott Dam. This is a Project access road, owned and exclusively used by PG&E, and includes a security gate.

Trails

There are no public use hiking trails within the Federal Energy Regulatory Commission (FERC) Project boundary. However, there are two public use recreation trails in the Lake Pillsbury area: the Lakeshore Trail (FS 10W54) and the Sunset Nature Trail (FS 10W60). Parking for both trailheads is located east of Lake Pillsbury. In addition, the following trail provides access to the Project site.

- **Scott Dam Piezometers and Leakage Weirs Access Trail:** The Scott Dam Piezometers and Leakage Weirs Access Trail is an approximately 600-foot (ft.), packed dirt Project trail that provides pedestrian access to the south side of Scott Dam and, specifically, the piezometers and leakage weirs. The trail is privately owned by PG&E and is intended for use by PG&E only.

Transit

Public transit services in Lake County are provided by Lake Transit. The fixed service routes do not extend to the Project area and primarily provide access around Clear Lake and to the cities of Clearlake, Lakeport, and Ukiah (Lake Transit 2024).

Aviation Facilities

The Gravelly Valley Airport, north of Lake Pillsbury, provides access to the Scott Dam Area by air. The airport, which provides one gravel landing strip, is owned by USFS but is open to the public. The Gravelly Valley Airport serves an average of 83 takeoffs and landings per month (AirNav 2024).

3.3.17.5 Cape Horn Dam Area

The Cape Horn Dam Area includes Cape Horn Dam and Van Arsdale Reservoir. The Cape Horn Dam Area is rural in nature. Cape Horn Dam is accessible by vehicle year-round, although public access across the crest of Cape Horn Dam is not allowed. There is a 6-ft.-high chain-link fence with barbed wire at the top mounted on outrigger to prohibit public access on both sides of Cape Horn Dam and its associated facilities. A safety barrier consisting of a floating plastic buoy boom is located upstream of the dam and fish ladder tailrace to restrict boating and swimming. There are no marked bicycle facilities in the Cape Horn Dam Area.

Van Arsdale Reservoir is accessible to the public via East Side Potter Valley Road/Eel River Road (Map 3.3.17-2).

Roadways

The primary roadways in the vicinity are described below and shown in Map 3.3.17-2:

- **Van Arsdale Road:** Van Arsdale Road is a paved, two-lane road that runs west of the Eel River, starting at Van Arsdale Reservoir. The road begins from Eel River Road in the south, extends northward for approximately 2 mi., and terminates in a dead end that provides access to residences.
- **Ridgeway Highway:** Ridgeway Highway is a paved, two-lane road without lane markers or shoulders that begins at Eel River Road to the southeast and extends northward, east of the Eel River. Ridgeway Highway eventually terminates after approximately 8 mi. at the Thomas Creek Trailhead.
- **Cape Horn Dam East Access Road:** Cape Horn Dam East Access Road is a short, gravel access road that connects Ridgeway Highway to the eastern side of Cape Horn Dam, including the leakage weirs, piezometers, and eastside storage building. This is a Project road that is exclusively used by PG&E.
- **Intake Access Road:** Intake Access Road connects Van Arsdale Road to the western side of Van Arsdale Reservoir and several associated maintenance facilities, including the

diversion intake, motor control building, and fish screen facility, among others. The road is gravel, and the entrance is gated. This is a Project road that is exclusively used by PG&E.

- **Powerhouse Road:** Powerhouse Road is a paved, two-lane road without lane markers or shoulders that extends through northern Potter Valley, connecting Gibson Lane to the Potter Valley Powerhouse. Access to the powerhouse facility is blocked by a security gate.
- **Powerhouse Main Access Road:** Powerhouse Main Access Road is the paved travel lane from Powerhouse Road and across the Potter Valley Powerhouse facility. This is a Project road that is exclusively used by PG&E.
- **Penstock, Pipeline and Butterfly Valve House Access Road:** This gravel access road extends northward from Powerhouse Road, along the penstock bypass channel, to the 72-inch butterfly valve house and across Tunnel No. 2, from where it travels southerly to the 60-inch-diameter gate valves at Penstock Nos. 1 and 2. This is a Project road that is exclusively used by PG&E.

Trails

There are no public use hiking trails within the FERC Project boundary. The following private trail provides access to Project facilities:

- **Gage E11 Access Trail:** Gage E11 Access Trail is a 166-ft. Project trail that connects Van Arsdale Road to the Eel River north of Cape Horn Dam. The trail is privately owned by PG&E and is intended for use by PG&E only.

Transit

Public transit services are not provided within the Cape Horn Dam Area. Mendocino Transit Authority provides public transportation services within Mendocino County, but it does not provide access to the Project area. The public transit route closest to the Project is Route 20 – Willits/Ukiah (Mendocino Transit Authority 2024).

Aviation Facilities

The Potter Valley Powerhouse Helicopter Landing Site is available in the Cape Horn Dam Area, adjacent to the Potter Valley Powerhouse.

3.3.17.6 Eel River Watershed

The Eel River Watershed includes the Eel River from Scott Dam to the Pacific Ocean and its tributaries, the most prominent of which are the Middle Fork Eel River, North Fork Eel River, South Fork Eel River, and Van Duzen River. In addition, it includes the estuary where the Eel River discharges into the Pacific Ocean. The Eel River Watershed covers a large area of Lake County, Mendocino County, Glenn County, Humboldt County, and Trinity County. This discussion focuses on the southernmost portion of the Eel River Watershed, including the Scott Dam Area, along the Eel River, and the northeastern portion of the Cape Horn Dam Area, where Project activities would occur (Map 3.3.17-3).

The southern Eel River Watershed is rural in nature. The most significant roadway in the area is Highway 101. As of 2022, the segment of Highway 101 through the city of Willits experiences a maximum of 7,900 average daily vehicle trips (Caltrans 2024).

3.3.17.7 Russian River Watershed

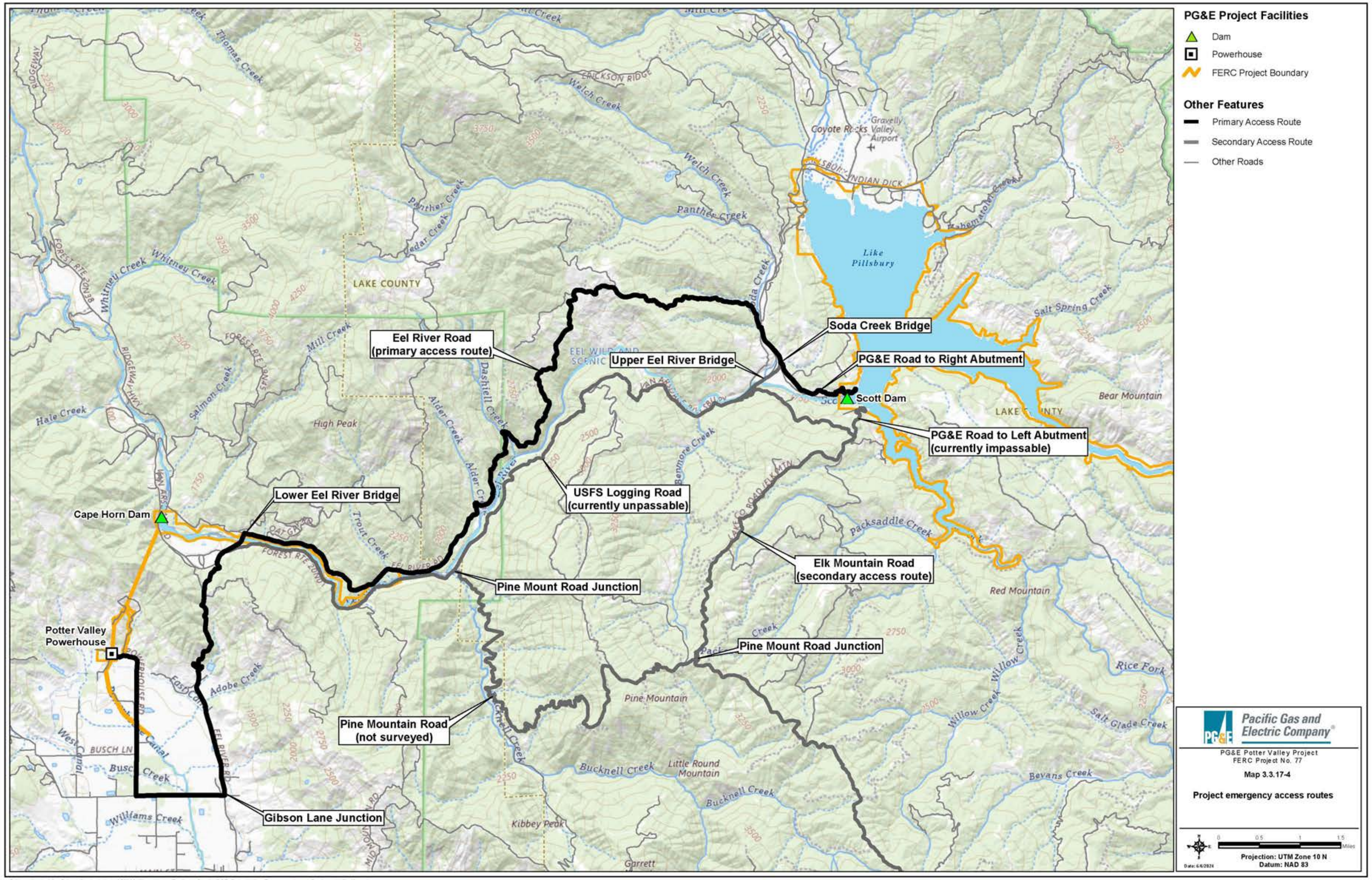
The Russian River Watershed includes the East Branch Russian River, Lake Mendocino, and the Russian River and extends within portions of Lake County, Mendocino County, and Sonoma County. Similar to the discussion of the Eel River Watershed (Section 3.3.17.3), this discussion focuses on the northernmost portion of the Russian River Watershed, including the southwestern portion of the Cape Horn Dam Area and northern Potter Valley, where Project activities would occur (Map 3.3.17-3).

The northern Russian River Watershed is rural in nature, and the most significant roadways in the area are Highway 101 and Highway 20. As of 2022, the segment of Highway 101 through Redwood Valley experiences a maximum of 24,000 average daily vehicle trips, and the segment of Highway 20 immediately east of Redwood Valley experiences a maximum of 11,500 average daily vehicle trips (Caltrans 2024). It is anticipated that haul truck traffic associated with the Project would travel along Highway 20 to Highway 101, southbound toward Ukiah.

3.3.17.8 Emergency Evacuation Routes

In the event of an emergency at the Project facilities, Lake, Mendocino, Trinity, and Humboldt counties have the authority and responsibility for community notification and evacuation. PG&E operations personnel can respond to an emergency at Scott Dam within 45 minutes to 2 hours by vehicle and at Cape Horn Dam within 30 minutes to 2 hours by vehicle, year-round. During a dam safety incident if PG&E is delayed or unable to quickly respond at Scott Dam or Cape Horn Dam, USFS or Lake Pillsbury Fire Protection District may be able to provide surveillance and monitoring that could decrease incident response time. The access route to reach both Scott Dam and Cape Horn Dam in the event of an emergency is included as Map 3.3.17-4.

This Page Intentionally Left Blank



Map 3.3.17-4. Project emergency access routes.

This Page Intentionally Left Blank

3.3.17.9 References

AirNav. 2024. 1Q5 Gravelly Valley Airport, Upper Lake, California. Available at: http://airnav.com/airport/1q5. Accessed April 2024.

Caltrans (California Department of Transportation). 2024. Traffic Census Program, 2022 AADT. Available at: https://dot.ca.gov/programs/traffic-operations/census. Accessed April 2024.

Lake APC (Lake Area Planning Council). 2022. Regional Transportation Plan/Active Transportation Plan. Available at: https://0m0ea5.p3cdn1.secureserver.net/wp-content/uploads/2022/02/Final-2022-RTP-ATP-2-9-22.pdf. Accessed May 2024.

Lake APC (Lake Area Planning Council). 2011. Regional Bikeway Plan. Available at: https://www.lakeapc.org/wp-content/uploads/2018/06/Regional-Bikeway-Plan-2011.pdf. Accessed May 2024.

Lake APC (Lake Area Planning Council). 2016. Lake County Active Transportation Plan. Available at: https://www.lakeapc.org/wp-content/uploads/2018/06/Final-ATP-Plan-2016.pdf. Accessed May 2024.

Lake APC (Lake Area Planning Council). 2020. Vehicle Miles Traveled Regional Baseline Study. Available at: https://0m0ea5.p3cdn1.secureserver.net/wp-content/uploads/2020/12/SB743-VMT-Baseline-Study-FINAL.pdf. Accessed May 2024.

Lake County. 2008. Lake County General Plan, Transportation and Circulation Element. Available at: https://www.lakecountyca.gov/DocumentCenter/View/1671/Chapter-6---Transportation-and-Circulation-PDF. Accessed May 2024.

Lake Transit. 2024. Routes & Schedules. Available at: https://laketransit.org/routes-schedules/. Accessed April 2024.

MCOG (Mendocino Council of Governments). 2022. Mendocino County Regional Transportation and Active Transportation Plan. Available at: https://www.mendocinocog.org/files/55b961dcb/2022+RTP-ATP+Proposed+Final-Feb+2022+PDF-A.pdf. Accessed May 2024.

Mendocino County. 2020. Mendocino County General Plan, Development Element. Available at: https://www.mendocinocounty.gov/home/showpublisheddocument/54479/638055061911270000. Accessed May 2024.

Mendocino Transit Authority. 2024. Maps and Schedules. Available at: https://mendocinotransit.org/maps-and-schedules/. Accessed April 2024.

USFS (United States Forest Service). 2024. Motor Vehicle Use Maps, Mendocino National Forest. Available at: https://www.fs.usda.gov/detail/mendocino/maps-pubs/?cid=FSBDEV3_004435. Accessed May 2024.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Acronyms

BIA	Biologically Important Area
CDFW	California Department of Fish and Wildlife
Council	Pacific Fishery Management Council
CE	California state endangered species
CT	California state threatened species
DPS	distinct population segment
EEZ	exclusive economic zone
EFH	essential fish habitat
ESA	Endangered Species Act
ESHA	environmentally sensitive habitat area
ESU	evolutionarily significant unit
FE	Federal Endangered
FERC	Federal Energy Regulatory Commission
FT	Federal Threatened
ft.	foot/feet
FMP	fishery management plan
FP	CDFW Fully Protected Species
FR	Federal Register
in.	inch(es)
LCP	Local Coastal Program
m	meter(s)
Marine Study Area	intertidal, tidal, and oceanic habitats between the mouth of the Eel River estuary and the open ocean
mi.	miles
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NOAA	National Oceanic and Atmospheric Administration
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
U.S.	United States
USFWS	U.S. Fish and Wildlife Service

3.3.18 Marine Resources

3.3.18.1 Introduction

This section describes marine resources, including rare, threatened, and endangered marine resources, potentially affected by the Pacific Gas and Electric Company's Potter Valley Hydroelectric Project (Project). Only marine resources are discussed in this section, which include species and resources in intertidal, tidal, and oceanic habitats between the mouth of the Eel River estuary and the open ocean (referred to as the "Marine Study Area"). Section 3.3.3 (Fish and Aquatic Resources) provides a discussion of estuarine, fish, and aquatic resources.

3.3.18.2 Information Sources

The information presented in this section was developed using existing data obtained from the following publicly accessible sources:

- California Department of Fish and Wildlife (CDFW), California Natural Diversity Database (CNDDB 2024), Enhanced Status Reports, Lower Eel River Basin Assessment (CDFW 2010), and MarineBIOS website;
- National Oceanic and Atmospheric Administration (NOAA) Fisheries Essential Fish Habitat (EFH) Mapper, Section 7 Protected Resources Application, Species Directory, and Marine Mammal Stock Assessment Reports (Caretta et al. 2022, 2023);
- Ocean Biodiversity Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP 2024) website for spatial densities of marine mammals, sea turtles, and cartilaginous fish;
- Pacific Fishery Management Council (Council) fishery management plans and their amendments, which include respective essential fish habitat descriptions; and
- Humboldt County General Plan Volume II: Eel River Area Plan of the Humboldt County Local Coastal Program, Eel River Area Plan definition of environmentally sensitive habitat areas (ESHAs) (County of Humboldt 2007).

3.3.18.3 Marine Study Area

The Marine Study Area includes intertidal, tidal, and oceanic habitats between the mouth of the Eel River estuary and the open ocean. The Marine Study Area is shown in Map 3.3.18-1.

3.3.18.4 Marine Physical Setting, Habitats, and Critical Habitat

Physical Setting

The mouth of the Eel River is located within the Eureka littoral cell, which is bounded by Trinidad Head to the north and Cape Mendocino to the south. This cell is characterized by long, linear beaches; dune systems; and spits that have formed through the deposition of sand from the Eel, Mad, and Little rivers (Hapke *et al.* 2006). Sediments exit the mouths of these rivers and enter the Pacific Ocean during high-discharge events and ebb tides. From there, sediments are transported along the shoreline within the littoral cell by waves and currents.

The wave climate along the Northern California coast is very energetic. The largest waves occur between November and February and average about 10 feet (ft.) in height, with waves exceeding 13 ft. 20 percent of that time. Summer conditions bring smaller waves, with average wave heights of approximately 6 ft. During El Niño periods, winter waves are generally 1–4 ft. greater than the average winter waves (Hapke *et al.* 2006).

Sediment transport along the shoreline is governed by the direction of wave travel. Along the Pacific Coast, coastal storms tend to originate from the north to northwest, creating waves that travel in the south-to-southeast direction. During El Niño events, storms typically come from the west or southwest and cause waves to travel in the northern direction. However, along the Eureka littoral cell, due to its northeast shoreline orientation, the net sediment transport within the littoral cell is northward (Bodin 1982; Peterson *et al.* 2009).

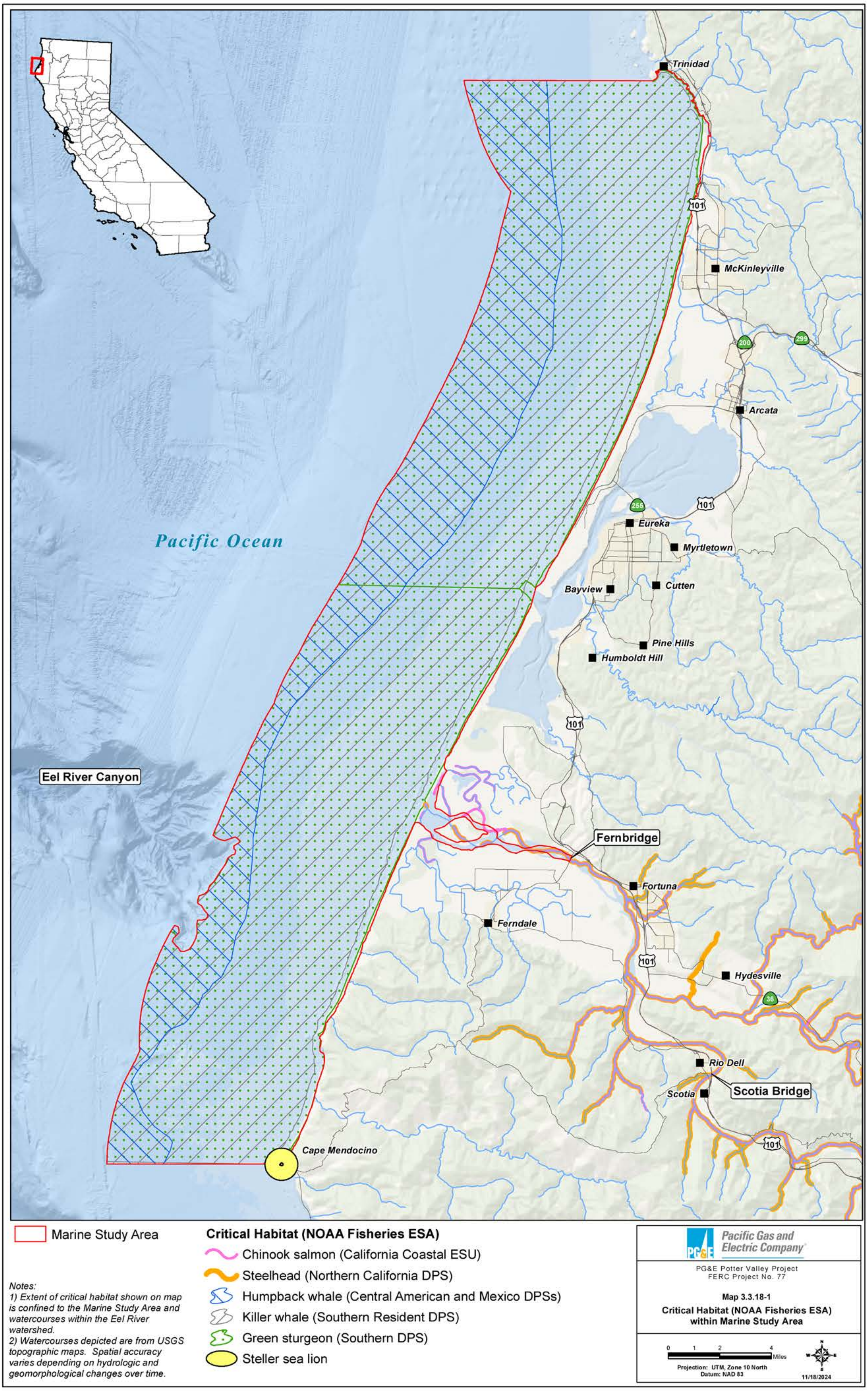
The sediment within the Eureka littoral cell predominantly originates from the Eel River (Wheatcroft *et al.* 1997; Wheatcroft and Borgeld 2000; Warrick *et al.* 2015). This is due to the high amounts of rainfall, steep terrain, and logging activities occurring throughout the Eel River basin. Fine sediment carried by the Eel River exits to the ocean through coastal river plumes during discharge events and ebb tides. Increased sediment loads occur in the winter during high amounts of rainfall, which tend to coincide with winter storms originating from the south and seasonal downwelling that produce northerly currents. As a result, sediment exiting the mouth of the Eel River typically travels north toward Humboldt Bay. Surveys conducted during the winter floods of 1996–1997 and 1997–1998 indicate that the Eel River plume exited the river mouth and traveled north, staying inshore of the 130-ft.-depth contour (Geyer *et al.* 2000). However, studies suggest that 40 to 75 percent of the sediment discharged by the Eel River settles out of the plume before reaching the entrance to Humboldt Bay (Geyer *et al.* 2000; Hill *et al.* 2000). Based on the tidal plume dynamics of the Eel River, along with the large tidal exchange and tidal asymmetry of Humboldt Bay, sediments may be transported into Humboldt Bay during flood tides (Peterson *et al.* 2021). Some fine sediment exiting the mouth of the river will travel offshore to the Eel Canyon,[1] particularly during periods of high wave energy and low river discharge (Scully *et al.* 2003).

Marine Habitats

Intertidal Zone

The intertidal zone includes sandy or rocky shoreline habitat between the high- and low-tide boundary. These tidal periods result in multiple intertidal zones to which species have adapted. These include the spray zone (a zone with almost no submergence), high intertidal, mid-intertidal, and low intertidal, which is the most submerged zone. The species that live in intertidal zones must tolerate being submerged and exposed to air for extended periods at different times of day or night.

[1] A submerged oceanic canyon approximately 7 miles (mi.) offshore of the Eel River mouth.



Map 3.3.18-1 Critical Habitat (NOAA Fisheries ESA) within Marine Study Area

This Page Intentionally Left Blank

Open Ocean

This habitat includes almost any part of the ocean that is not near the shoreline. It has many layers depending on water depth, each with unique marine life. Open ocean lies over the continental shelf in the epipelagic and mesopelagic zones, yet it does not include the seafloor itself. Farther from the continental shelf is the continental slope in the bathypelagic zone, the continental rise in the abyssopelagic zone, and the ocean basin. Beyond the ocean basin are trenches or canyons with water depths down to 36,100 ft. (11,003 meters [m]).

Benthic

The benthic zone is the lowest level of the seafloor. It contains a collection of decayed matter and fine materials that have sunken and accumulated over time. It begins at the shoreline and continues to the deepest part of the ocean where there is little light penetrating from the surface. Benthos inhabit the seafloor sediments.

Critical Habitat

After a species receives an ESA listing designation, NOAA Fisheries evaluates each species to determine whether any areas meet the critical habitat definition, if so, these areas can be designated through the rulemaking process for the conservation of the listed species. Designated critical habitat within the Marine Study Area is provided in Table 3.3.18-1 and shown on Map 3.3.18-1.

Table 3.3.18-1. Designated critical habitat within the Marine Study Area.

Designated Habitat	Description
Green sturgeon – Southern DPS (*Acipenser medirostris)*	Marine critical habitat for green sturgeon occurs in nearshore and offshore waters in the Marine Study Area (NOAA Fisheries 2021a).
Chinook salmon (*Oncorhynchus tshawytscha)*	Designated critical habitat for the California coastal Chinook salmon evolutionarily significant unit (ESU) occurs in the Marine Study Area (NOAA Fisheries 2005, 2021a, 2024).
Humpback whale (*Megaptera novaeangliae)*	Designated critical habitat for both the Mexico and Central America DPSs spans the coastline along WA, OR and CA and occurs within the Marine Study Area (NOAA Fisheries 2021d)
Steelhead (*Oncorhynchus mykiss)*	Designated critical habitat for the Northern California steelhead DPS occurs within the Marine Study Area (NOAA Fisheries 2021b).
Steller sea lion (*Eumetopias jubatus)*	Critical habitat for Steller sea lions is present on and around Sugarloaf Island, approximately 20 mi. south of Humboldt Bay (NOAA Fisheries 2021a).
Southern Resident killer whale DPS (*Orcinus orca)*	NOAA Fisheries (2019) proposed critical habitat for the Southern Resident killer whale DPS from Puget Sound, Washington, to Point Sur, California, including the coasts of Humboldt, Mendocino, Sonoma, Marin, and San Francisco counties between depths of 20 and 656 ft waters in the Marine Study Area. The critical habitat designation was finalized in 2021 (NOAA Fisheries 2021c).

Note: DPS = distinct population segment

The California Coastal Act governs development within the coastal zone of California through issuance of coastal development permits by the California Coastal Commission or a local government. The California Coastal Act delegates permitting authority to county governments through the creation of Local Coastal Programs (LCPs). Each LCP defines ESHAs unique to their program area. Generally, ESHAs consist of any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments (California Coastal Act Section 30107.5), including areas of special biological significance as identified by the State Water Resources Control Board; rare and endangered species habitat identified by CDFW[2]; all coastal wetlands and lagoons; all marine, wildlife, and education and research reserves; nearshore reefs; tidepools; sea caves; islets and offshore rocks; kelp beds; indigenous dune plant habitats; and wilderness and primitive areas.

The Humboldt County Eel River Area Plan, in which the Marine Study Area is located, defines the following habitats as ESHAs:

- Rivers, creeks, and associated riparian habitats;
- Estuaries, sloughs, and wetlands;
- Rookeries for herons and egrets;
- Harbor seal pupping areas; and,
- Critical habitats for rare or endangered species listed on state or federal lists.

Of these five ESHAs, only critical habitats for rare or endangered species overlap the marine environment. Critical habitat for the Southern DPS of green sturgeon (*Acipenser medirostris)*, Chinook salmon (*Oncorhynchus tshawytscha)*, Northern California steelhead (*Oncorhynchus mykiss)*, Steller sea lion (*Eumetopias jubatus*), Mexico and Central America DPSs of humpback whale (*Megaptera novaeangliae)*, and the Southern Resident killer whale (*Orcinus orca*) Southern Resident DPS occurs within the Marine Study Area (Table 3.3.18-1 and Map 3.3.18-1). These areas of critical habitat, therefore, receive additional protections under Humboldt's Local Coastal Program (LCP) as ESHAs.

3.3.18.5 Marine Community

The following section describes the marine community in the Marine Study Area. Special-status anadromous fish, sea turtles, marine mammals, and federally managed fish species with their respective high value habitats including critical habitat or essential fish habitat that are known to occur, or potentially occur within the Marine Study Area, are discussed within the relevant community description below.

[2] Rare and endangered species as identified by the California Department of Fish and Wildlife and the California Fish and Game Commission.

Algae

Giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*) are common along this stretch of coastline in the subtidal area. These large, brown algae species are depth-dependent, relying on the photic zone for growth in water depths to approximately 98 ft. (35 m) (CDFW 2021). As a result, they are limited to shallower nearshore waters in the intertidal and subtidal zones.

Benthic Macroinvertebrates

The benthic marine community includes many invertebrate species that provide ecosystem services integral to the ocean's systems. Many of these organisms are decomposers, sifting through seafloor detritus and breaking it into particles that eventually form the seafloor sediment. These macroinvertebrates are typically sessile (anchored) or very slow-moving, resulting in an inability to avoid disturbances that other, more mobile, taxa can flee. Although individual macroinvertebrates may be unable to flee disturbance, on a community level these assemblages are resilient and can quickly recolonize following disturbance.

Marine Molluscs

Marine mollusc communities within the Marine Study Area occur in subtidal and intertidal zones and include squids and octopuses; whelks and other sea snails; chitons and limpets; sea rabbits and other nudibranchs; and bivalves such as clams, oysters, scallops, mussels, and cockles. Molluscs play crucial roles in the coastal and marine ecosystem by improving water quality via filter feeding; shaping marine plant community structure through grazing; and serving as primary predators, prey, and decomposers. Bivalves and chitons burrow into sediments and influence sediment stability, nutrient exchange, and oxygenation and provide habitat for other organisms. Bivalves are often colonial, and even when their shells are empty, they provide substrates, shelter, nursery habitats, and feeding grounds for various marine organisms. Filter-feeding bivalves are often used as indicators of environmental pollution because they can accumulate heavy metals, pesticides, and other contaminants in their tissues and provide insight into the health of the marine environment (Marine Conservation Society 2024).

Marine Crustaceans

Dungeness Crab

Dungeness crabs (*Metacarcinus magister*) are arthropods with hard shells that are found in coastal areas and that occupy sandy seafloor and eelgrass habitat of the Pacific and north of Point Conception, California (a headland in southern Santa Barbara County north of the Channel Islands) to Alaska. The Dungeness crab fishery is one of the most important commercial fisheries on the West Coast. The main body of the crab's shell is between 6 to 7 inches (in.) across at the broadest point with 4 jointed legs and 2 claws, and the species has a life cycle of up to 6 years. Dungeness crabs play an important role in the food web by cycling nutrients and through decomposition (CDFW 2022).

Krill

All species of euphausiids (krill) are crustaceans. They are approximately 8 to 70 millimeters (0.31 to 2.8 in.) in length and can be up to 14 centimeters (5.5 in.) long with a hard exoskeleton, 3 main segments, and appendages like shrimp. The most common krill species are part of the highly migratory species FMP, and they, along with other dominant krill species (Table 3.3.18-3) such as *Euphausia pacifica* and *Thysanoessa spinifera*, are likely to be targeted by fishing (PFMC 2021. They feed on diatoms and stay aggregated in swarms with fish, whales, and other species that prey on them.

Ocean Pink Shrimp

Ocean pink shrimp (*Pandalus jordani*) are free-swimming crustaceans with a hard outer shell, long bodies, and antennae. They are fast-growing, from 0.5 in. at year 1 to 1.1 in. at year 3. While their life cycle may be as long as 5 years, they rarely survive longer than 4 years. There is an important commercial fishery for ocean pink shrimp primarily employing trawling gear, and they inhabit oceanic waters from British Columbia to Point Arguello (CDFW 2023).

Anadromous and Marine Fish

Numerous anadromous and marine fish species occur in the Marine Study Area (Table 3.3.18-2). Fish species spending the majority of their life cycle in freshwater are covered in more detail in Section 3.3.3, Fish and Aquatic Resources. Some Pacific Coast marine and anadromous fish species are managed according to the four Pacific Coast FMPs: groundfish, coastal pelagic species, highly migratory species, and Pacific salmon. Each management plan describes EFH for each group, and each group is further subdivided into stocks (Tables 3.3.18-3 through 3.3.18-5).

Table 3.3.18-2. Anadromous and marine fish species in the Marine Study Area.

Common Name	Scientific Name
Anadromous Fish Species	
Juvenile Chinook salmon, FT	*Oncorhynchus tshawytscha*
Juvenile coho salmon, FT	*Oncorhynchus kisutch*
Juvenile steelhead trout, FT	*Oncorhynchus mykiss*
Juvenile cutthroat trout	*Oncorhynchus clarkii*
Green sturgeon (Southern DPS is marine, and the Northern DPS is riverine)	*Acipenser medirostris*
White sturgeon (California ESA candidate species as threatened)	*Acipenser transmontanus*
Pacific lamprey	*Entosphenus tridentatus*
American shad	*Alosa sapidissima*
Longfin smelt	*Spirinchus thaleichthys*

Common Name	Scientific Name
Estuarine or Marine Fish Species	
Eulachon, FT	*Thaleichthys pacificus*
Surf smelt	*Hypomesus pretiosus*
Pacific herring	*Clupea pallasii*
Pacific sardine	*Sardinops sagax*
Northern anchovy	*Engraulis mordax*
Top smelt	*Atherinops affinis*
Staghorn sculpin	*Leptocottus armatus*
Bay pipefish	*Syngnathus californiensis*
Walleye surfperch	*Hyperprosopon argenteum*
English sole	*Parophrys vetulus*
Starry flounder	*Platichthys stellatus*
Sand sole	*Psettichthys melanostictus*
Cabezon	*Scorpaenichthys marmoratus*
Saddleback gunnel	*Pholis ornata*
Stickleback	*Gasterosteus aculeatus*
Tidepool sculpin	*Oligocottus maculosus*
Bay goby	*Lepidogobius lepidus*
Tidewater goby, CE	*Eucyclogobius newberryi*
Ring-tail snailfish	*Liparis rutteri*
Buffalo sculpin	*Enophrys bison*
Jack mackerel	*Trachurus symmetricus*

Source: CDFW 2010

Notes: CE = California State Endangered Species
CT = California State Threatened Species
DPS = distinct population segment
ESA = Endangered Species Act
FE = Federal Endangered Species
FT = Federal Threatened Species

Coastal Pelagic Species

Coastal pelagic species that may occur in offshore waters along the Northern California coast include six actively managed species or species groups: northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), California market squid (*Loligo opalescens*), and krill (Table 3.3.18-3) (PFMC 2017). Coastal pelagic species are generally found anywhere from the surface to 3,281 ft. (1,000 m) deep in the water column. The EFH for these species is in marine and estuarine waters along the coast of Northern California and offshore to the exclusive economic zone (EEZ) boundary line (Map 3.3.18-2). Harvest of all species of krill is prohibited in the West Coast EEZ to ensure fisheries will not develop that could put krill stocks and the other living marine organisms that depend on krill at risk (PFMC 2021).

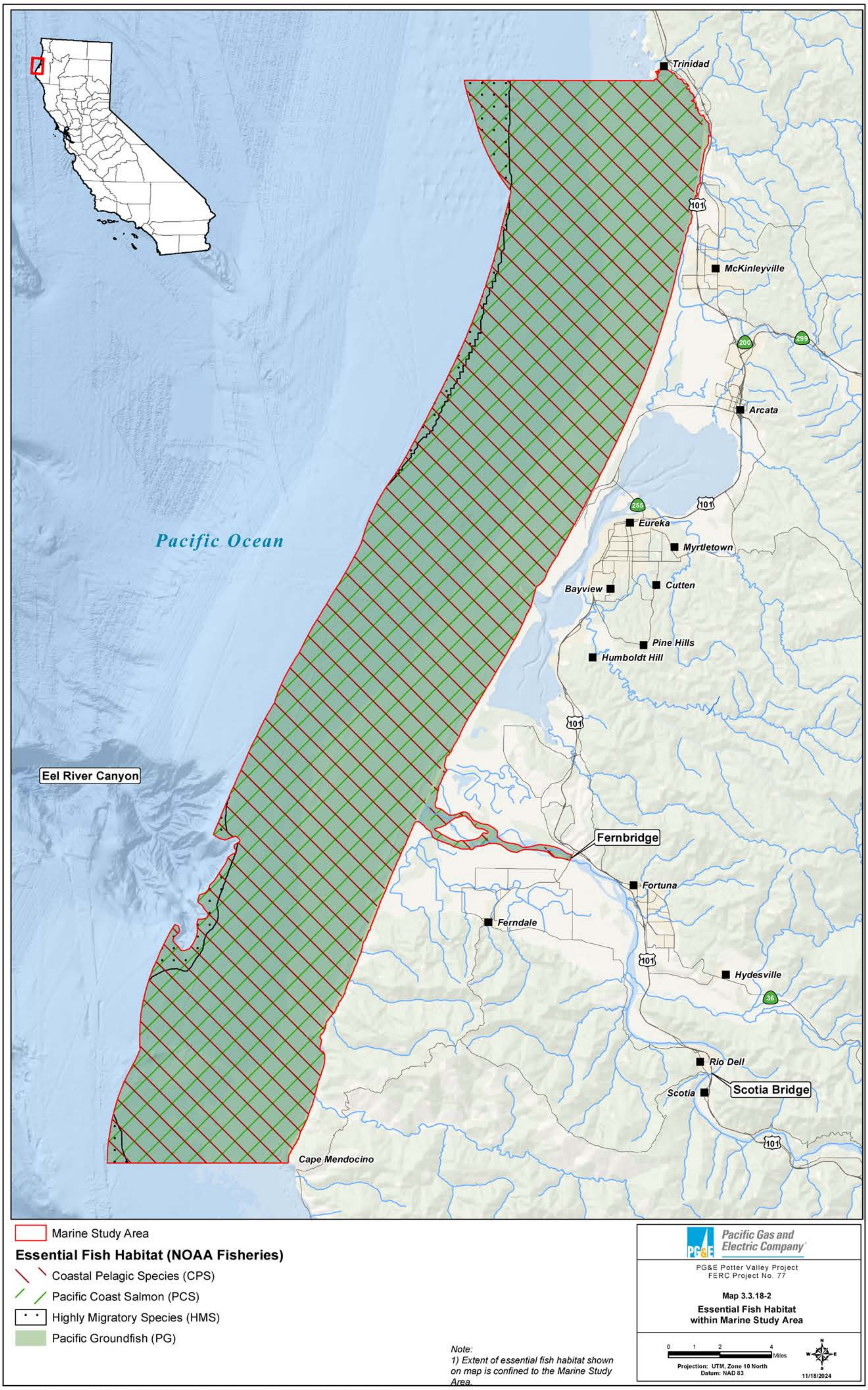
Table 3.3.18-3. Taxa managed under the Coastal Pelagic Species Fishery Management Plan.

Common Name	Scientific Name
Pacific sardine	*Sardinops sagax*
Pacific (chub) mackerel	*Scomber japonicus*
Northern anchovy – central and northern subpopulations	*Engraulis mordax*
Market squid	*Doryteuthis opalescens*
Jack mackerel	*Trachurus symmetricus*
Krill or euphausiids	*Euphausia pacifica*
	Thysanoessa spinifera
	Nyctiphanes simplex
	Nematoscelis difficilis
	Thysanoessa gregaria
	Euphausia recurva
	Euphausia gibboides
	Euphausia eximia
Pacific herring	*Clupea pallasii pallasii*
Jacksmelt	*Atherinopsis californiensis*

Source: PFMC 2019a

Pacific Groundfish

Pacific groundfish include many resident species along the West Coast. The Northern California coast provides groundfish habitat from the nearshore mean high water elevation, or the upstream extent of saltwater intrusion, to deepwater areas seaward to the boundary of the EEZ. In 1998, the Council designated more than 400 EFH areas for 82 groundfish species (Table 3.3.18-4) (PFMC 2005). The Council further defined important habitat by species and life stage. Map 3.3.18-2 shows the Pacific groundfish EFH within the Marine Study Area.



Map 3.3.18-2. Essential fish habitat within Marine Study Area.

This Page Intentionally Left Blank

Table 3.3.18-4. Groundfish stock within the Pacific Groundfish Fishery Management Plan, as amended.

Common Name	Scientific Name
Elasmobranchs	
Pacific spiny dogfish	*Squalus suckleyi*
Roundfish	
Lingcod north	*Ophiodon elongatus*
Lingcod south	*Ophiodon elongatus*
Sablefish	*Anoplopoma fimbria*
Rockfish	
Black rockfish – Washington	*Sebastes melanops*
Black rockfish – California	*Sebastes melanops*
Canary rockfish	*Sebastes pinniger*
Copper rockfish north	*Sebastes caurinus*
Copper rockfish south	*Sebastes caurinus*
Quillback rockfish – Washington	*Sebastes maliger*
Quillback rockfish – Oregon	*Sebastes maliger*
Quillback rockfish – California	*Sebastes maliger*
Squarespot rockfish	*Sebastes hopkinsi*
Vermilion rockfish	*Sebastes miniatus*
Vermilion/Sunset rockfish	*Sebastes miniatus/Sebastes crocotulus*
Shortspine thornyhead	*Sebastolobus alascanus*
Flatfish	
Dover sole	*Microstomus pacificus*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*

Source: PFMC 2023a

Highly Migratory Species

Highly migratory species are pelagic fish species such as tunas, marlins, and sharks that occur worldwide. They can be found in the EEZ out to 230 mi. (370 kilometers) from shore and in the high seas (PFMC 2018). Highly migratory species with EFH (Table 3.3.18-5) off the Northern California coast may include common thresher shark (*Alopias vulpinus*), bigeye thresher shark (*Alopias superciliosus*), albacore tuna (*Thunnus alalunga*), northern bluefin tuna (*Thunnus orientalis*), and broadbill swordfish (*Xiphias gladius*) (PFMC 2018). Map 3.3.18-2 shows the EFH for highly migratory species within the Marine Study Area.

Table 3.3.18-5. Taxa managed in the Highly Migratory Species Fishery Management Plan.

Common Name	Scientific Name
Tunas	
North Pacific albacore	*Thunnus alalunga*
Yellowfin tuna	*Thunnus albacares*
Bigeye tuna	*Thunnus obesus*
Skipjack tuna	*Katsuwonus pelamis*
Pacific bluefin tuna	*Thunnus orientalis*
Sharks	
Common thresher shark	*Alopias vulpinus*
Shortfin mako or bonito shark	*Isurus oxyrinchus*
Blue shark	*Prionace glauca*
Billfish/Swordfish	
Striped marlin	*Tetrapturus audax*
Swordfish	*Xiphias gladius*
Other	
Dorado or dolphinfish	*Coryphaena hippurus*

Source: PFMC 2023b

Pacific Coast Salmon

EFH for Chinook and coho salmon (Table 3.3.18-6) includes rivers and coastal streams from Central California to Alaska and oceanic waters along the U.S. and Canadian coasts seaward to the north-central Pacific Ocean and the high seas (PFMC 2024a). The marine environment covers an extensive area and has not been well-sampled. Therefore, EFH for salmon in the ocean cannot be precisely defined. Salmon EFH occurs within aquatic habitats of the Marine Study Area, and coho and Chinook salmon are likely to occur in many streams and tributaries. Adult and juvenile coho and Chinook salmon forage in nearshore and offshore areas (PFMC 2024a). Map 3.3.18-2 shows the extent of Pacific coast salmon EFH in the Marine Study Area. Additional information about coho and Chinook salmon in the Eel River is provided in Section 3.3.3, Fish and Aquatic Resources.

Table 3.3.18-1. Species managed in the Pacific Coast Salmon Fishery Management Plan.

Common Name	Scientific Name	Status
Chinook, California Coastal ESU	*Oncorhynchus tshawytscha*	FT
Coho salmon, Southern Oregon/Northern California Coast ESU	*Oncorhynchus kisutch*	FT

Source: PFMC 2024a; NOAA Fisheries 2005; Federal Register (FR) 9/16/1999 (64 FR 50394) (70 FR 37159) updated 4/14/2019 (79 FR 20802) and 06/28/2005 (70 FR 37159 Critical Habitat 01/02/2006, (70 FR 52488); 06/28/2005 70 FR 37160;
Notes: ESU = evolutionarily significant unit; FT = Federal Threatened Species

Sea Turtles

NOAA Fisheries (2021c) identified three species of ESA-listed sea turtles that may be present in the Marine Study Area, including green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), and olive ridley sea turtle (*Lepidochelys olivacea*) (Table 3.3.18-7).

Table 3.3.18-7. Special-status sea turtles known to occur or potentially occurring in the Marine Study Area.

Common Name (Scientific Name)	Status
Green sea turtle – East Pacific DPS (*Chelonia mydas*)	FT
Leatherback sea turtle (*Dermochelys coriacea*)	FE
Olive ridley sea turtle (*Lepidochelys olivacea*)	FT

Sources: NOAA Fisheries 2016, 2021c; USFWS 2021a, 2021b
Notes: FE = Federal Endangered Species; FT = Federal Threatened Species

Sea turtles are rarely observed off the Northern California coast. Researchers conducted aerial line transects of leatherback sea turtles in waters less than 302 ft. deep off the coast of Central and Northern California between 1990 and 2003. The average estimated annual abundance was 178 turtles, with the highest densities off Central California (Benson *et al.* 2007). None of the detected individuals was reported north of Cape Mendocino. USFWS (2021a, 2021b) lists the green sea turtle as potentially occurring on beaches in the Marine Study Area, but this species does not nest on the West Coast. Green sea turtles have been sighted in marine waters as far north as southern Alaska, but they most commonly occur from San Diego south (Seminoff *et al.* 2015; NOAA Fisheries 2021c). Olive ridley sea turtles in the north Pacific typically occur from Southern California south to Chile, though they have been recorded as far north as Alaska (NOAA Fisheries and USFWS 2014; NOAA Fisheries 2021c).

Marine Mammals

Cetaceans

Twenty-four species of cetaceans may occur within the Marine Study Area (NOAA Fisheries 2023). Cetaceans are subdivided into Odontocetes (toothed whales) and Mysticetes (baleen whales). All cetaceans have developed highly sophisticated acoustic abilities with which they send and receive sonic signals for communication and navigation. The species most likely to frequent offshore waters within the Marine Study Area include Dall's porpoise (*Phocoenoides dalli*), Risso's dolphin (*Grampus griseus*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) (Table 3.3.18-8). Species likely to occur in the offshore or nearshore zone include gray whale (*Eschrichtius robustus*), blue whale (*Balaenoptera musculus*), humpback whale both the Mexico and Central America DPSs (*Megaptera novaeangliae*), Southern resident killer whales and the transient ecotype of the killer whale (*Orcinus orca*). The most common species that occurs year-round in nearshore areas is the harbor porpoise (*Phocoena phocoena*) (H.T. Harvey & Associates 2020).

NOAA Fisheries has established Biologically Important Areas (BIAs) within the Marine Study Area. BIAs do not afford cetaceans additional legal protections. BIAs for blue whales, gray whales, and humpback whales occur off the Northern and Central California coast extending from shore to approximately 20 mi. offshore (NOAA Fisheries 2021d). The gray whale migration corridor extends across the entire coast of California and is within the Marine Study Area. Peak migration periods for this species are January through July and October through December (NOAA Fisheries 2021d). Blue whale feeding BIAs are present between Point Arena and Fort Bragg (peak activity from August through November) and in the Greater Farallones (peak activity from July through November). Humpback whale feeding BIAs (peak activity from July through November) overlap blue whale feeding BIAs.

Critical habitat was designated by NOAA Fisheries in 2021 for the Southern Resident killer whale DPS from Puget Sound, Washington, to Point Sur, California, including the coasts of Humboldt, Mendocino, Sonoma, Marin, and San Francisco counties between depths of 20 and 656 ft. (NOAA Fisheries 2021b). Critical habitat for both DPS of humpback whale, Mexico and Central America DPSs, was designated in 2021 (NOAA) which spans the length of Washington, Oregon and California as it encompasses areas where their prey occur within the California Current Ecosystem.

Pinnipeds

Pinnipeds include a wide range of species that occur in all four marine zones. Some species, such as California sea lions (*Zalophus californianus*) and harbor seals (*Phoca vitulina richardii*), frequently haul out on the shoreline, while others, such as northern elephant seals (*Mirounga angustirostris*), spend all of their non-breeding lives in deep water off the continental shelf (Table 3.3.18-8) (NOAA Fisheries 2021c). Pinniped species likely to occur regularly in the Marine Study Area include California sea lion, harbor seal, and Steller sea lion. The Steller sea lion has ESA-designated critical habitat near Sugarloaf Island in Humboldt County.

Mustelids

The southern sea otter (*Enhydra lutris nereis*) primarily occurs from Monterey south to Point Conception but is occasionally observed as far north as San Francisco (MMC 2021). Southern sea otters, also known as California sea otters, live in nearshore waters along the Central California coastline. Additionally, marine-adapted river otters (*Lontra canadensis*) are unique to Humboldt County (Table 3.3.18-8).

Table 3.3.18-8. Marine mammals known to occur or potentially occurring in the Marine Study Area.

Common Name (Scientific Name)	Status
Mustelids	
Southern sea otter (*Enhydra lutris nereis*)	FT, FP, MMPA
Pinnipeds	
California sea lion (*Zalophus californianus*)	MMPA
Guadalupe fur seal (*Arctocephalus townsendi*)	FT, CT, FP, MMPA
Northern elephant seal (*Mirounga angustirostris*)	MMPA
Northern fur seal (*Callorhinus ursinus*)	MMPA
Pacific harbor seal (*Phoca vitulina*)	MMPA
Steller sea lion (*Eumetopias jubatus*)[1]	MMPA
Cetaceans	
Baird's beaked whale (*Berardius bairdii*)	MMPA
Blue whale (*Balaenoptera musculus*)	FE, MMPA
Cuvier's beaked whale (*Ziphius cavirostris*)	MMPA
Dall's porpoise (*Phocoenoides dalli*)	MMPA
Dwarf sperm whale (*Kogia sima*)	MMPA
False killer whale (*Pseudorca crassidens*)	MMPA
Fin whale (*Balaenoptera physalus*)	FE, MMPA
Gray whale, eastern north Pacific (*Eschrichtius robustus*)	MMPA
Harbor porpoise (*Phocoena phocoena*)	MMPA
Hubb's beaked whale (*Mesoplodon carlhubbsi*)	MMPA
Humpback whaleMexico and Central American DPSs (*Megaptera novaeangliae*)[1]	FE, MMPA
Minke whale (*Balaenoptera acutorostrata*)	MMPA
North Pacific right whale (*Eubalaena japonica*)	FE, MMPA
Northern right whale dolphin (*Lissodelphis borealis*)	MMPA
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	MMPA
Pygmy sperm whale (*Kogia breviceps*)	MMPA
Risso's dolphin (*Grampus griseus*)	MMPA
Sei whale (*Balaenoptera borealis*)	FE, MMPA
Short-beaked common dolphin (*Delphinus delphis*)	MMPA
Short-finned pilot whale (*Globicephala macrorhynchus*)	MMPA

Common Name (Scientific Name)	Status
Southern Resident Killer Whale (*Orcinus orca*)	FE, MMPA, CH
Sperm Whale (*Physeter macrocephalus*)	FE, MMPA
Stejneger's beaked whale (*Mesoplodon stejnegeri*)	MMPA
Striped dolphin (*Stenella coeruleoalba*)	MMPA
Transient ecotype of killer whales (*Orcinus orca*)	MMPA

Sources: MMC 2021; NOAA Fisheries 2016, 2021a, 2021c; USFWS 2021a, 2021b; Whale and Dolphin Conservation 2024

Notes: CH = Critical habitat in or near Marine Study Area.
CT = California State Threatened Species
FE = Federal Endangered Species
FP = CDFW Fully Protected Species
FT = Federal Threatened Species
MMPA = Marine Mammal Protection Act Species

3.3.18.6 References

Benson, S.R., K.A. Forney, J.T. Harvey, J.V. Carretta, and P.H. Dutton. 2007. Abundance, Distribution, and Habitat of Leatherback Turtles (*Dermochelys coriacea*) off California, 1990−2003. Fishery Bulletin 105(3):337–347.

Bodin, P. 1982. Longshore and Seasonal Variations in Beach Sand Humboldt County, California: Implications for Bulk Longshore Transport Direction. M.S. Thesis. Humboldt State University, Arcata, California.

Carretta, J.V., E.M. Oleson, K.A. Forney, D.W. Weller, A.R. Lang, J. Baker, A.J. Orr, B. Hanson, J. Barlow, J.E. Moore, M. Wallen, and R.L. Brownell Jr. 2022. U.S. Pacific Marine Mammal Stock Assessments: 2022. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-684. Available at: https://doi.org/10.25923/5ysf-gt95.

Carretta, J.V., E.M. Oleson, K.A. Forney, A.L. Bradford, K. Yano, D.W. Weller, A.R. Lang, J. Baker, A.J. Orr, B. Hanson, J.E. Moore, M. Wallen, and R.L. Brownell Jr. Draft U.S. Pacific Marine Mammal Stock Assessments: 2023. Available at: https://www.fisheries.noaa.gov/s3/2024-01/Draft-2023-Pacific-MMSARs.pdf

CDFW (California Department of Fish and Wildlife). 2010. Lower Eel River Watershed Assessment. Coastal Watershed Planning and Assessment Program. Fortuna, California.

CDFW (California Department of Fish and Wildlife). 2021. Enhanced Status Reports. Marine Species Portal. Giant Kelp and Bull Kelp Enhanced Status Report. Available at: https://marinespecies.wildlife.ca.gov/kelp/true/.

CDFW (California Department of Fish and Wildlife). 2022. Enhanced Status Reports. Marine Species Portal. Dungeness Crab Enhanced Status Report. Available at: https://marinespecies.wildlife.ca.gov/dungeness-crab/the-species/.

CDFW (California Department of Fish and Wildlife). 2023. Enhanced Status Reports. Marine Species Portal. Pink Shrimp Enhanced Status Report. Available at: https://marinespecies.wildlife.ca.gov/pink-(ocean)-shrimp/.

CNDDB (California Natural Diversity Database). 2024. State- and Federally Listed Endangered and Threatened Animals of California. Sacramento, California. Available at: https://wildlife.ca.gov/Data/CNDDB. April.

County of Humboldt. 2007. Humboldt County General Plan Appendix E Local Coastal Plans. Local Coastal Program Eel River Area Plan Of The Humboldt County. Available at: https://humboldtgov.org/DocumentCenter/View/50843/Eel-River-Area-Local-Coastal-Plan. Accessed November 2024.

Geyer, W.R., P. Hill, T. Milligan, and P. Traykovski. 2000. The structure of the Eel River plume during floods. Continental Shelf Research 20:2,067–2,093.

H.T. Harvey & Associates. 2020. Existing Conditions and Potential Environmental Effects. In M. Severy, Z. Alva, G. Chapman, M. Cheli, T. Garcia, C. Ortega, N. Salas, A. Younes, J. Zoellick, and A. Jacobson (eds.). California North Coast Offshore Wind Studies. Humboldt, California: Schatz Energy Research Center. Available at: https://schatzcenter.org/pubs/2020-OSW-R13.pdf.

Hapke, C.J., D. Reid, B.M. Richmond, P. Ruggiero, and J. List. 2006. National Assessment of Shoreline Change: Part 3: Historical Shoreline Changes and Associated Coastal Land Loss along the Sandy Shorelines of the California Coast. U.S. Geological Survey Open-File Report 2006-1219.

Hill, P.S., T.G. Milligan, and W.R. Geyer. 2000. Controls on effective settling velocity of suspended sediment in the Eel River flood plume. Continental Shelf Research 20:2,095–2,112.

Marine Conservation Society. 2024. https://www.marinebio.org/creatures/marine-invertebrates/mollusks/.

MMC (Marine Mammal Commission). 2021. Southern Sea Otter. Available at: https://www.mmc.gov/priority-topics/species-of-concern/southern-sea-otter/.

NOAA (National Oceanic and Atmospheric Administration) Fisheries 2005. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Federal Register/Vol. 70 No. 170/Friday, September 2, 2005. https://www.govinfo.gov/content/pkg/FR-2005-09-02/pdf/05-16389.pdf

NOAA (National Oceanic and Atmospheric Administration) Fisheries and USFWS (U.S. Fish and Wildlife Service). 2014. Olive Ridley Sea Turtle (*Lepidochelys olivacea*) 5-Year Review: Summary and Evaluation. June. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland, and U.S. Fish and Wildlife Service, Southeast Region, Jacksonville, Florida.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2019. Federal Register: Endangered and Threatened Wildlife and Plants; Proposed Rulemaking to Revise Critical Habitat for the Southern Resident Killer Whale Distinct Population Segment. Federal Register Volume 84, Number 182: 49,215–49,235. Available at: https://www.federalregister.gov/documents/2019/09/19/2019-20166/endangered-and-threatened-wildlife-and-plants-proposed-rulemaking-to-revise-critical-habitat-for-the

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2023. Biologically Important Areas (BIA II) for Cetaceans: 2023 Updates. Available at: https://experience.arcgis.com/experience/51a9e25c75a1470386827439a918e056

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2021a. Species Directory. Available at: https://www.fisheries.noaa.gov/species-directory.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2021b. Sea Turtles. Available at: https://www.fisheries.noaa.gov/sea-turtles.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2021c. Endangered and Threatened Wildlife and Plants; Revision of Critical Habitat for the Southern Resident Killer Whale Distinct Population Segment. Federal Register/Vol. 86, No. 145/Monday, August 2, 2021/Rules and Regulations.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2021d. Fisheries Endangered and Threatened Wildlife and Plants: Designating Critical Habitat for the Central America, Mexico, and Western North Pacific Distinct Population Segments of Humpback Whales. Federal Register/Vol. 86, No. 75/ Wednesday, April 21, 2021. https://www.govinfo.gov/content/pkg/FR-2021-04-21/pdf/2021-08175.pdf

Ocean Biodiversity Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP). 2024. Available at: https://seamap.env.duke.edu/species/948946%20. Accessed June 12, 2024.

Peterson, C.D., E. Stock, R. Hart, D. Percy, S.W. Hostetler, and J.R. Knott. 2009. Holocene coastal dune fields used as indicators of net littoral transport: West Coast, USA. Geomorphology 116:115–134.

Peterson, C.D., D.J. Pettit, K. Kingen, S. Vanderburgh, and C. Rosenfeld. 2021. Catastrophic beach sand losses due to erosion from predicted future sea level rise (0.5–1.0 m), based on increasing submarine accommodation spaces in the high-wave-energy coast of the Pacific Northwest, Washington, Oregon, and Northern California, USA. Marine Geology 439: 106555.

PFMC (Pacific Fishery Management Council). 2005. Amendment 18 (Bycatch Mitigation Program), Amendment 19 (Essential Fish Habitat) to the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. November 2005. Available at: https://www.pcouncil.org/documents/2006/09/amendment-18-to-groundfish-fmp.pdf/. Accessed February 18, 2021.

PFMC (Pacific Fishery Management Council). 2017. Status of the Pacific Coast Coastal Pelagic Species Fishery and Recommended Acceptable Biological Catches: Stock Assessment and Fisheries Evaluation 2016. Pacific Fishery Management Council, Portland, Oregon.

PFMC (Pacific Fishery Management Council). 2018. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species, as Amended through Amendment 5. Available at: https://www.pcouncil.org/documents/2018/04/fishery-management-plan-for-west-coast-fisheries-for-highly-migratory-species-through-amendment-5.pdf/.

PFMC (Pacific Fishery Management Council). 2019a. Coastal Pelagic Species Fishery Management Plan, as Amended through Amendment 17. 49 pp. Available at: https://www.pcouncil.org/documents/2019/06/cps-fmp-as-amended-through-amendment-17.pdf/. June.

PFMC (Pacific Fishery Management Council). 2019b. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. Appendix B, Part 2. Available at: https://www.pcouncil.org/documents/2019/06/groundfish-fmp-appendix-b-part-2.pdf/. June.

PFMC (Pacific Fishery Management Council). 2021. Groundfish: Background. Pacific Fishery Management Council, Portland, Oregon. Available at: https://www.pcouncil.org/background-coastal-pelagic-species/.

PFMC (Pacific Fishery Management Council). 2023a. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. 159 pp. December.

PFMC (Pacific Fishery Management Council). 2023b. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species, Amended through Amendment 7. Available at: pcouncil.org/documents/2023/04/fishery-management-plan-for-west-coast-fisheries-for-highly-migratory-species-through-amendment-5.pdf/.

PFMC (Pacific Fishery Management Council). 2024a. Pacific Coast Salmon Plan. Fishery Management for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California, as Revised through Amendment 24. https://www.pcouncil.org/documents/2022/12/pacific-coast-salmon-fmp.pdf/

PFMC (Pacific Fishery Management Council). 2024b. Review of 2023 Ocean Salmon Fisheries: Stock Assessment and Fishery Evaluation Document for the Pacific Coast Salmon Fishery Management Plan. (Document prepared for the Council and its advisory entities.) Available at: https://www.pcouncil.org/documents/2024/02/review-of-2023-ocean-salmon-fisheries.pdf/.

Scully, M.E., C.T. Friedrichs, and L.D. Wright. 2003. Numerical modeling of gravity-driven sediment transport and deposition on an energetic continental shelf: Eel River, northern California. Journal of Geophysical Research: Oceans 108(C4):3,120.

Seminoff, J.A., C.D. Allen, G.H. Balazs, P.H. Dutton, T. Eguchi, H.L. Haas, S.A. Hargrove, M.P. Jensen, D.L. Klemm, A.M. Lauritsen, S.L. MacPherson, P. Opay, E.E. Possardt, S.L. Pultz, E.E. Seney, K.S. Van Houtan, R.S. Waples. 2015. Status Review of the Green Turtle (*Chelonia mydas*) under the U.S. Endangered Species Act. NOAA Technical Memorandum, NOAA-NOAA Fisheries-SWFSC-539. 571 pp. Available at: https://repository.library.noaa.gov/view/noaa/4922.

USFWS (U.S. Fish and Wildlife Service). 2021a, 2021b. Information for Planning and Consultation (IPaC) Resource List. Available at: https://ecos.fws.gov/ipac/.

Warrick, J.A., J.M. Melack, and B.M. Goodridge. 2015. Sediment yields from small, steep coastal watersheds of California. Journal of Hydrology: Regional Studies 4:516–534.

Whales and Dolphins Conservation. 2024. Available at: https://us.whales.org/about/ Accessed November 2024.

Wheatcroft, R.A., C.K. Sommerfield, D.E. Drake, J.C. Borgeld, and C.A. Nittrouer. 1997. Rapid and widespread dispersal of flood sediment on the northern California margin. Geology 25:163–166.

Wheatcroft, R.A., and J.C. Borgeld. 2000. Oceanic flood deposits on the northern California shelf: large-scale distribution and small-scale physical properties. Continental Shelf Research 20(16):2,163–2,190.

TABLE OF CONTENTS

List of Tables

List of Acronyms

ac-ft	acre-foot/acre-feet
BMP	best management practice
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

This Page Intentionally Left Blank

3.4 Application for Surrender of License

This section provides an analysis of the potential effects of decommissioning the Potter Valley Hydroelectric Project (Project) on environmental and cultural resources. This section follows the Federal Energy Regulatory Commission's (FERC's) guidelines *Preparing Environmental Documents: Guidelines for Applicants, Contractors, and Staff* (FERC 2008).

3.4.1 Environmental Effects

The analyses presented in this section are based on the information presented in Section 3.3, which documents the environmental, recreational, and cultural resource conditions as they exist now with the Project in place and operated and maintained in accordance with the current FERC license and which would continue under the No-Action Alternative.

Following an overview of the analytical approach (Section 3.4.1.1), potential environmental effects that could occur under the Proposed Action relative to the No-Action Alternative are discussed in detail in Sections 3.4.1.2 through 3.4.1.19, organized as follows:

- 3.4.1.2, Water Use and Hydrology;
- 3.4.1.3, Water Quality;
- 3.4.1.4, Fish and Aquatic Resources;
- 3.4.1.5, Botanical Resources;
- 3.4.1.6, Wildlife Resources;
- 3.4.1.7, Geology and Soils;
- 3.4.1.8, Geomorphology;
- 3.4.1.9, Land Use;
- 3.4.1.10, Recreation Resources;
- 3.4.1.11, Aesthetic Resources;
- 3.4.1.12, Cultural Resources;
- 3.4.1.13, Tribal Resources;
- 3.4.1.14, Socioeconomic Resources;
- 3.4.1.15, Environmental Justice;
- 3.4.1.16, Air Quality;
- 3.4.1.17, Noise;
- 3.4.1.18, Traffic; and
- 3.4.1.19, Marine Resources.

3.4.1.1 Analytical Approach

This section describes the approach used to identify and analyze the potential effects of decommissioning the Project on environmental and cultural resources.

This environmental analysis is based on information included in Pacific Gas and Electric Company's (PG&E's) Preliminary Application Document for the Project (PG&E 2017), data collected as part of initiation of 21 approved study plans developed as part of the relicensing process (FERC 2018), and information included in PG&E's Initial Draft Surrender Application and conceptual Decommissioning Plan (PG&E 2023). Additional information available for the Project Area is also incorporated, as appropriate.

This section describes the approach used to identify and analyze the potential effects of decommissioning the Project (Proposed Action) relative to the existing baseline condition. Modeled existing baseline hydrology (2004 through 2023) was used to represent the No-Action Alternative in the effects analyses and reflects (1) the current reservoir storage seismic restriction (reduces Lake Pillsbury's storage capacity by approximately 20,000 ac-ft) and (2) current operations that have included variance to the Reasonable and Prudent Alternative flows (NMFS 2002), particularly in the East Branch Russian River. The modeled existing baseline flows are the same as PG&E's proposed amendment flows for the East Branch Russian River and average Potter Valley Irrigation District irrigation season deliveries in recent years.

Unimpaired stream flow in the Eel River at Scott Dam was calculated using a mass balance approach whereby inflow equals the change in Lake Pillsbury storage plus releases plus evaporation. Accretions along the Eel River were calculated by subtracting the upstream stream gage from the downstream stream gage in a given reach. Unimpaired flows in the Eel River from Cape Horn Dam to the Eel River near Scotia CA stream gage (United States Geological Survey gage no. 11477000) were determined by adding the calculated accretions to the unimpaired flow at the location upstream. Unimpaired flow through the Potter Valley Powerhouse was assumed to be zero. Unimpaired flows in the East Branch Russian River were developed using a mass balance approach based on available gage data.

Existing sediment modeling and analyses were utilized to assess the potential volume of erodible sediment in Lake Pillsbury and Van Arsdale Reservoir and how it would be transported and deposited downstream following dam removal. These models, described in more detail in Section 3.3.7, included the following:

- Conceptual Sediment Erosion Model (Stillwater Sciences 2021a) to estimate the volume and general locations of impounded sediment within Lake Pillsbury that could be present due to erosion and transported downstream;
- Suspended Sediment Transport Model (Stillwater Sciences 2021a), a two-phase conceptual model for fine sediment erosion following dam removal to assess the general magnitude of suspended sediment concentration and duration of high suspended sediment concentration impact downstream of the dams;

- Gravel Transport Dynamics (Stillwater Sciences 2021b) were based on sediment pulse evolution theory and observations from previous dam removals; and
- Sand Transport Model (Stillwater Sciences 2021b; Dam Removal Express Assessment Model 1) to assess erosion and downstream transport and deposition of sand.

The effects analysis is organized into two phases within each resource area—Construction and Deconstruction Effects and Post-facility Removal Effects. Components of the Proposed Action that are analyzed under each phase are summarized below.

- **Phase 1: Construction and Deconstruction Effects** are temporary effects that may occur during the following:
  - Scott Dam and associated ancillary/recreation facility removal
    - Initial low-flow season activities (June–October)
    - Blasting to remove the adit plug during the first high-flow season (November–May)
    - Removal of the dam during the second low-flow season and after sediment flushing (June–October)
  - Recreation facility removal
  - Cape Horn Dam and ancillary facility removal
    - Low-flow season activities (March–October)
    - Physical removal of the cofferdam following decommissioning of Cape Horn Dam and construction of the New Eel-Russian Facility (NERF), as described under Section 2.2.2, Non-Project Use of Project Lands (October–January)

These effects would result from implementation of the following activities within the Scott Dam and Cape Horn Dam construction areas (Map 2-8 and Map 2-10): site access improvements, construction of temporary access roads, installation of cofferdams and drawdown or dewatering of the dam construction areas, ground disturbance, and use of heavy equipment. Construction effects would also occur from the transport of materials and workers to and from the work areas (e.g., helicopter and truck trips).

- **Phase 2: Post-facility Removal Effects** are the resulting physical conditions following removal of Lake Pillsbury (i.e., adit plug removal), Scott Dam, Cape Horn Dam, and ancillary/recreation facilities and implementation of restoration activities. Post-facility removal has been further defined to include two phases—Phase 2a and Phase 2b, as described below.
  - **Phase 2a: Initial Conditions and Preliminary Restoration** includes analysis of the initial temporary physical conditions that will occur immediately following dam and ancillary/recreation facility removal, including the following:
    - Loss of the facility or feature (e.g., loss of reservoir, ancillary facility, or recreation facility)
    - Initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam (including cofferdam removal)
    - Pulse hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam until the reservoir is drained
    - Sediment load/deposition and turbidity in the Eel River downstream of Scott Dam and Cape Horn Dam
    - Continued degraded water quality and sediment deposition after the initial sediment release until the system stabilizes and water quality and sediment transport return to natural conditions
    - Ground disturbance, use of heavy equipment, and transport of materials to and from the Scott Dam and Cape Horn Dam restoration areas to allow for restoration of the former dam sites and ancillary/recreation facility sites
  - **Phase 2b: Resulting Conditions and Restoration** includes analysis of the resulting conditions following dam and ancillary/recreation facility removal, including the following:
    - Unimpaired hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam
    - Restored sediment transport and water quality in the Eel River downstream of Scott Dam and Cape Horn Dam
    - Natural hydrology in the East Branch Russian River
    - Restored former reservoir beds and ancillary/recreation facility sites following facility removal

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Cape Horn Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season.

Two alternate sequencing options to remove Scott Dam and Cape Horn Dam are qualitatively evaluated for each resource area, as appropriate:

- If the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam:
  - Sediment would be deposited behind Cape Horn Dam and in the fish ladder.
  - Removal of this additional sediment would be necessary prior to the removal of Cape Horn Dam and prior to fish moving upstream past Cape Horn Dam.
  - Sediment would be released into the Eel River twice, first with the removal of Scott Dam and second with the removal of the cofferdams at Cape Horn Dam.
  - The Eel River in the vicinity of Cape Horn Dam may need to be dewatered for more than one construction season.
  - The Van Arsdale Diversion Intake could potentially be buried or partially be buried, reducing or eliminating the ability to divert flow to the East Branch Russian River.
- If Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam:
  - Subsequent sediment release from Scott Dam would be deposited in the vicinity of the new NERF diversion intake, potentially burying or partially burying it.
  - Sediment/turbidity from the Eel River could be diverted to the East Branch Russian River via the NERF diversion or the NERF diversion facilities would be inoperable until the sediment was removed.
  - Sediment would be released at two different times as the result of two activities—removal of the cofferdams at Cape Horn Dam and after the removal of Scott Dam.
  - Fish would be able to move upstream past Cape Horn unimpeded/unmanaged with the removal of the dam into the reach between Scott Dam and Cape Horn Dam prior to release of sediment from Scott Dam. Fish mortality would be caused by the removal of Scott Dam.

The effects determinations for each environmental and cultural resource considers construction best management practices (BMPs), environmental measures, and plans under the Proposed Action (Table 3.4.1.1-1). The following effects determinations were used in the analysis:

- **No Effect –** Implementation of the Proposed Action would protect and maintain a resource.
- **Negligible Effect –** Implementation of the Proposed Action would have a negligible effect on a resource, or the implementation of environmental measures will reduce the effect to a negligible level.

- **Adverse Effect** – Implementation of the Proposed Action would have a significant effect on a resource that may be reduced, but not to a negligible level, through implementation of new environmental measures.
- **Beneficial Effect (Enhancement) –** Implementation of the Proposed Action would benefit the resource.

A list and description of environmental measures is provided in Section 2.2.3.

Table 3.4.1.1-1. Plans and measures to be implemented during the short-term temporary construction activities phase (Phase 1) and post-facility removal and restoration phase (Phases 2a and 2b) under the Proposed Action.

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Phase 1: Short-term Construction Activities																		
General Construction Measures																		
General Construction Measures (including noise, air quality, and Construction Transportation Management Plan)				X	X			X	X	X	X	X			X	X	X	
Biological Resources Measures - Wildlife																		
General Wildlife Measures					X							X						
Bald Eagle Conservation Plan					X							X						
Northern Spotted Owl Management Plan					X							X						
Other Raptor Construction Measures					X							X						
Other Special-status Birds and Game Birds Construction Measure					X							X						
Special-status Bats Construction Measures					X							X						

	Potentially Affected Resource																	
Proposed Plan or Measure	**Water Use and Hydrology**	**Water Quality**	**Fish and Aquatic Resources**	**Botanical Resources**	**Wildlife Resources**	**Geology and Soils**	**Geomorphology**	**Land Use**	**Recreation Resources**	**Aesthetic Resources**	**Cultural Resources**	**Tribal Resources**	**Socioeconomic Resources**	**Environmental Justice**	**Air Quality**	**Noise**	**Traffic**	**Marine Resources**
Special-status Mesocarnivore Construction Measures					X							X						
Biological Resources Measures - Aquatics																		
Construction Aquatic Species Management and Monitoring Plan			X						X			X	X	X				
Estuary Protection Plan			X						X			X						X
Construction Non-native Invasive Aquatic Species Management Plan			X						X			X						
Biological Resources Measures - Botanical																		
Invasive Weed Construction Measures				X	X						X	X						
Riparian and Wetland Protection Measures				X	X						X	X						
Special-status Plant Construction Measures				X							X	X						
Cultural and Tribal Resources Measures																		
Memorandum of Agreement (Known Historic Properties)											X	X						
Programmatic Agreement and Historic Properties Management Plan											X	X						

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Fire Prevention and Suppression Measures																		
Construction Fire Plan								X										
Hazardous Materials Measures																		
Hazardous Materials Handling Measures		X	X			X					X	X	X	X				X
Spill Prevention, Control, and Countermeasures Plan		X	X			X							X	X				X
Hydrology, Sediment, and Restoration Measures																		
East Branch Russian River Diversion Plan	X	X	X				X		X		X	X	X	X				
Flood Monitoring Plan							X				X							
Restoration Plan				X		X	X	X	X		X	X						
Sediment/Channel Monitoring and Response Plan							X				X	X						
Land Use Measures																		
Post-construction Road Restoration Plan								X			X	X	X	X				
Public Safety Measures																		
Public Safety Plan						X			X									

	Potentially Affected Resource																	
Proposed Plan or Measure	**Water Use and Hydrology**	**Water Quality**	**Fish and Aquatic Resources**	**Botanical Resources**	**Wildlife Resources**	**Geology and Soils**	**Geomorphology**	**Land Use**	**Recreation Resources**	**Aesthetic Resources**	**Cultural Resources**	**Tribal Resources**	**Socioeconomic Resources**	**Environmental Justice**	**Air Quality**	**Noise**	**Traffic**	**Marine Resources**
Recreation Measures																		
Construction Recreation Plan								X	X		X	X						
Slope Stability Measures																		
Scott Dam Slope Stability Monitoring Plan						X					X							
Water Quality and Erosion Control Measures																		
BMPs to protect water quality		X	X			X	X		X			X	X	X				X
Construction Erosion Prevention Plan		X	X			X	X		X		X	X	X	X				X
Construction Site Water Diversion, Dewatering, and Drawdown Plan	X	X	X				X		X		X	X	X	X				X
Construction Water Quality and Water Temperature Monitoring Plan		X	X				X		X			X	X	X				X
Stormwater Pollution Prevention Plan		X	X	X			X		X				X	X				X

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Phase 2a: Post-removal Restoration – Initial Conditions and Preliminary Restoration																		
General Restoration Measures																		
General Restoration Measures (including noise, air quality, and Construction Transportation Management Plan)				X	X						X	X			X	X	X	
Biological Resources Measures - Wildlife																		
General Wildlife Restoration Measures					X							X						
Bald Eagle Conservation Plan					X							X						
Northern Spotted Owl Management Plan					X							X						
Other Raptor Restoration Measures					X							X						
Other Special-status Birds and Game Birds Restoration Measures					X							X						
Special-status Mesocarnivores Restoration Measures					X							X						
Tule Elk Management Plan				X	X							X						
Wildlife Stranding Measure					X							X						

	Potentially Affected Resource																	
Proposed Plan or Measure	**Water Use and Hydrology**	**Water Quality**	**Fish and Aquatic Resources**	**Botanical Resources**	**Wildlife Resources**	**Geology and Soils**	**Geomorphology**	**Land Use**	**Recreation Resources**	**Aesthetic Resources**	**Cultural Resources**	**Tribal Resources**	**Socioeconomic Resources**	**Environmental Justice**	**Air Quality**	**Noise**	**Traffic**	**Marine Resources**
Biological Resources Measures - Aquatics																		
Post-dam Removal Aquatic Species Management and Monitoring Plan			X						X			X						X
Estuary Protection Plan			X				X					X						X
Biological Resources Measures - Botanical																		
Special-status Plant Restoration Measures				X							X	X						
Invasive Weed Restoration Measures				X	X						X	X						
Riparian and Wetland Protection Measures				X							X	X						
Cultural and Tribal Resources Measures																		
Memorandum of Agreement (Known Historic Properties)											X	X						
Programmatic Agreement and Historic Properties Management Plan											X	X						
Fire Prevention and Suppression Measures																		
Construction Fire Plan								X										

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Hazardous Materials Measures																		
Hazardous Materials Handling Measures (to be included in the Restoration Plan)		X	X			X		X										
Spill Prevention, Control, and Countermeasures Plan (to be included in the Restoration Plan)		X	X			X		X										
Hydrology, Sediment, and Restoration Measures																		
Flood Monitoring Plan							X	X										
Restoration Plan		X	X	X	X	X	X	X	X		X	X	X	X				X
Sediment/Channel Monitoring and Response Plan			X				X	X			X	X						X
Land Use Measures																		
Post-construction Road Restoration Plan								X					X	X				
Public Safety Measures																		
Public Safety Plan						X			X									

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Water Quality and Erosion Control Measures																		
BMPs to protect water quality (to be included in the Restoration Plan)		X	X			X	X	X	X			X						
Erosion Prevention Restoration Plan (to be included in the Restoration Plan)		X	X			X	X	X	X		X	X						
Post-construction Water Quality and Water Temperature Monitoring Plan		X	X				X	X	X			X						
Stormwater Pollution Prevention Plan (to be included in the Restoration Plan)		X	X			X	X	X	X									
Phase 2b: Resulting Conditions and Restoration																		
General Restoration Measures																		
General Restoration Measures					X						X	X						
Biological Resources Measures - Wildlife																		
General Wildlife Restoration Measures					X							X						
Bald Eagle Conservation Plan					X							X						
Tule Elk Management Plan					X							X						

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Biological Resources Measures - Aquatics																		
Post-dam Removal Aquatic Species Management and Monitoring Plan			X									X						X
Estuary Protection Plan			X				X					X						X
Biological Resources Measures - Botanical																		
Invasive Weed Restoration Measures				X								X						
Cultural and Tribal Resources Measures																		
Memorandum of Agreement (Known Historic Properties)											X	X						
Programmatic Agreement and Historic Properties Management Plan											X	X						
Fire Prevention and Suppression Measures																		
Construction Fire Plan								X										

	Potentially Affected Resource																	
Proposed Plan or Measure	**Water Use and Hydrology**	**Water Quality**	**Fish and Aquatic Resources**	**Botanical Resources**	**Wildlife Resources**	**Geology and Soils**	**Geomorphology**	**Land Use**	**Recreation Resources**	**Aesthetic Resources**	**Cultural Resources**	**Tribal Resources**	**Socioeconomic Resources**	**Environmental Justice**	**Air Quality**	**Noise**	**Traffic**	**Marine Resources**
Hazardous Materials Measures																		
Hazardous Materials Handling Measures (to be included in the Restoration Plan)		X	X			X		X										
Spill Prevention, Control, and Countermeasures Plan (to be included in the Restoration Plan)		X	X			X		X										
Hydrology, Sediment, and Restoration Measures																		
Flood Monitoring Plan							X	X				X						
Restoration Plan		X	X	X	X	X	X	X	X		X	X	X	X				X
Sediment/Channel Monitoring and Response Plan			X				X	X			X	X						X
Public Safety Measures																		
Public Safety Plan						X			X									

Proposed Plan or Measure	Potentially Affected Resource																	
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomic Resources	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources
Water Quality and Erosion Control Measures																		
BMPs to protect water quality (to be included in the Restoration Plan)		X	X			X	X	X				X						
Post-construction Water Quality and Water Temperature Monitoring Plan		X	X			X	X	X				X						
Stormwater Pollution Prevention Plan (to be included in the Restoration Plan)		X	X			X	X	X										

References

FERC (Federal Energy Regulatory Commission). 2008. Preparing Environmental Documents: Guidelines for Applicants, Contractors, and Staff. Federal Energy Regulatory Commission, Office of Energy Projects, Division of Hydropower Licensing. September 2008.

NMFS (National Marine Fisheries Service). 2002. Biological Opinion for the Proposed License Amendment for the Potter Valley Hydroelectric Project (FERC Project No. 77-110). Southwest Region. November.

PG&E (Pacific Gas and Electric Company). 2023. Potter Valley Hydroelectric Project, FERC Project No. 77, Initial Draft Surrender Application and Conceptual Decommissioning Plan. November 2023.

PG&E (Pacific Gas and Electric Company). 2018. Potter Valley Hydroelectric Project, FERC Project No. 77, Revised Study Plan. January 2018.

PG&E (Pacific Gas and Electric Company). 2017. Potter Valley Hydroelectric Project, FERC Project No. 77, Relicensing Pre-Application Document. Volume 1: Public Information Sections 1–7 and Volume 2: Public Information Appendices A–G. April 2017.

Stillwater Sciences. 2021a. Analyses of fine sediment erosion following the proposed Scott Dam removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

Stillwater Sciences. 2021b. Analyses and preliminary modeling of sediment transport following the proposed Scott Dam removal, Eel River, California. Technical Memorandum. Prepared for Two-Basin Solution Partners. November.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Acronyms

ac-ft	acre-feet
cfs	cubic foot/feet per second
ERPA	Eel-Russian Project Authority
NERF	New Eel-Russian Facility
NMFS	National Marine Fisheries Service
PG&E	Pacific Gas and Electric Company
PVID	Potter Valley Irrigation District
Project	Potter Valley Hydroelectric Project
RPA	Reasonable and Prudent Alternative

3.4.1.2 Water Use and Hydrology

This section describes the potential effects to water use and hydrology that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the changes in water use and hydrology that may result from activities to be implemented under the Proposed Action (Section 2.2) compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider construction measures and post-facility measures included to avoid or mitigate impacts associated with the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Area of Analysis

The Analysis Area includes Lake Pillsbury, Van Arsdale Reservoir, the Eel River from Lake Pillsbury downstream to the estuary, and the East Branch Russian River from the Potter Valley Powerhouse Tailrace downstream to Lake Mendocino.

Phase 1: Short-term Construction Effects

The following potential effects to water use and hydrology resulting from Project facility modifications were evaluated:

- Alteration of hydrology in the Eel River as a result of Lake Pillsbury drawdown and construction activities at Scott Dam;
- Alteration of hydrology in the Eel River as a result of Van Arsdale Reservoir drawdown and installation of dewatering and bypass systems at Cape Horn Dam; and
- Alteration of hydrology in the East Branch Russian River during construction.

Scott Dam Area

Scott Dam construction activities would occur within an area located upstream and downstream of the dam. The work area would include staging and stockpile areas, portable sanitary facilities, and designated refueling areas. A temporary access road and barge launch would be installed below the dam. An adit tunnel and channel would be constructed at the base of the dam/spillway with a capacity of approximately 7,000 cubic feet per second (cfs). The upper portion of the dam would be removed (dam lowering and spillway notching), and clean rubble would be placed in the plunge pool area. Sediment would be dredged from the upstream side of the dam at the location of the adit tunnel to facilitate sediment flushing when the adit plug is removed. Subsequent to the flushing, the remaining dam and facilities would be removed and the bulk of the dam material would be stored and capped on PG&E lands.

PG&E will develop a Construction Site Water Diversion, Dewatering, and Drawdown Plan for resource agency review and approval prior to construction. The plan would include drawdown flow scheduling (magnitude and timing), construction minimum flows in the Eel River below the dam, measures to ensure minimum instream flows are met, coordination with East Branch Russian River diversions, and avoidance of drawdown flows (magnitude and timing) that could adversely affect resources such as early cueing of Chinook salmon (*Oncorhynchus tshawytscha*) upstream migration. Water drawdown of the reservoir would occur using the 400-cfs capacity of the low-level outlet needle value. The Construction Site Water Diversion, Dewatering, and Drawdown Plan would be approved by resource agencies, including the National Marine Fisheries Service (NMFS). NMFS consultation would include modification of the Biological Opinion and Reasonable and Prudent Alternative (RPA) flows or some other mechanism to authorize potential non-compliance with the current RPA flows.

Construction activities at Scott Dam will temporarily affect hydrology in the Eel River downstream of the dam and have the potential to affect hydrology in the East Branch Russian River above Lake Mendocino. Drawdown of the reservoir using the low-level outlet needle valve will result in a release from Scott Dam of up to 400 cfs into the Eel River for a period of two to four months. Drawdown will be complete in October at approximately 10,000 acre-feet (ac-ft) of storage in Lake Pillsbury. The timing of the drawdown will be coordinated with water demands in the East Branch Russian River to the extent possible, which would result in a diversion of up to 130 cfs in the East Branch Russian River and release of 270 to 400 cfs to the Eel River below Cape Horn

Dam. The potential increase in flow above existing conditions depends on the water year type and associated minimum instream flow requirements. Flow rates during the drawdown and under existing conditions are shown in Table 3.4.1.2-1.

Table 3.4.1.2-1. Flow rates during initial drawdown.

Season	Flow under Existing Condition	Flow during Drawdown Period
Eel River below Scott Dam		
June	55 to 320 cfs	400 cfs
July through September	55 to 87 cfs	400 cfs
October	47 to 240 cfs	400 cfs
Eel River below Cape Horn Dam		
June	5 to 200 cfs	270 to 400 cfs
July through September	3 to 50 cfs	270 to 400 cfs
October	25 to 140 cfs	270 to 400 cfs
Release to East Branch Russian River		
June	10 to 80 cfs	0 to 130 cfs
July through September	10 cfs	0 to 130 cfs
October	10 to 40 cfs	0 to 130 cfs

Following the drawdown and dam lowering/spillway notching, natural flows would pass over the dam into the Eel River (there would be no storage). During times of low natural flow, this would result in less flow below Scott Dam than under existing conditions, and during times of high natural flow, this would result in more flow below Scott Dam than under existing conditions due to the lack of the ability of Scott Dam to impound water. The current RPA minimum instream flows below Scott Dam would only be met if natural flows meet or exceed the RPA minimum instream flows.

With implementation of the Construction Site Water Diversion, Dewatering, and Drawdown Plan; the drawdown of Lake Pillsbury; maintenance of construction minimum flows in the Eel River below the dam; and passage of natural flows over the dam after the spillway notch is completed, the Proposed Action would have a negligible effect on hydrology in the Eel River.

Cape Horn Dam Area

Cape Horn Dam construction activities would occur within an area located upstream and downstream of the dam. PG&E will develop a Construction Site Water Diversion, Dewatering, and Drawdown Plan for the construction work at Cape Horn Dam for resource agency review and approval prior to construction. A temporary access road would be constructed, and a bypass channel would be excavated through the earthen portion (right side) of Cape Horn Dam to pass Eel River flows downstream during construction. A temporary cofferdam at the top of the bypass channel would be constructed during excavation of the channel to prevent flow from entering until the channel is completed. It would be removed when the bypass channel is completed. Two channel-spanning cofferdams would be installed across the Eel River: one upstream of the Van Arsdale Diversion and the other downstream of Cape Horn Dam and the fish exclusion barrier. After the cofferdams are installed, the construction area would be dewatered and Cape Horn Dam and the fish hotel/exclusion barrier would be removed. PG&E would also develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. The plan would include coordination with the Eel-Russian Project Authority (ERPA) related to the New Eel-Russian Facility (NERF) construction (see Section 3.5 Non-Project Use of Project Lands) to ensure construction plans do not interfere with diversions to the East Branch Russian River. At the end of construction, the cofferdams would be removed and flow would be restored through the Eel River construction area.

The current RPA minimum instream flows would continue to be released into the Eel River below Cape Horn Dam during the drawdown of Lake Pillsbury. Following the drawdown, however, the RPA minimum instream flows could only be released into the Eel River below Cape Horn Dam when natural flow is sufficient. When natural flow is too low, less than the minimum flow would be released. During construction, if the upstream cofferdam is installed in the Eel River above the Van Arsdale Diversion, the diversion would not be operable and water diversions into the East Branch Russian River would cease. This would affect Potter Valley water supply and RPA minimum flows in the East Branch Russian River. The East Branch Russian River Diversion Plan would include measures that could include pumping, if needed, to continue providing water to the East Branch Russian River during construction.

With implementation of the Construction Site Water Diversion, Dewatering, and Drawdown Plan that includes construction minimum instream flows and measures to ensure minimum instream flows are met, sufficient flow will pass downstream into the Eel River. The Construction Site Water Diversion, Dewatering, and Drawdown Plan would be approved by resource agencies, including NMFS. NMFS consultation would include modification of the Biological Opinion and RPA flows or some other mechanism to authorize potential non-compliance with the current RPA flows. The East Branch Russian River Diversion Plan may include pumping of Eel River water into the diversion tunnel and into the East Branch Russian River, if needed, to continue providing water supply and minimum instream flows during PG&E's construction. With implementation of these mitigation measures, the Proposed Action effects on water use and hydrology would be negligible.

Phase 2: Post-facility Removal Effects

The following initial condition and preliminary restoration (Phase 2a) and resulting conditions and restoration (Phase 2b) potential effects to water use and hydrology were evaluated:

- Dam removal pulse hydrology in the Eel River (e.g., 7,000-cfs increase due to Scott Dam removal)
- Unimpaired flows in the Eel River
- Potential effects on RPA flows

- Potential effects on downstream Eel River water users
- Potential effects of altered hydrology on the East Branch Russian River
  - Water supply
  - East Branch Russian River flow
- Loss of generation

A discussion of the potential effects that could occur is provided below by river reach: Scott Dam to the Van Arsdale Diversion and downstream of the Van Arsdale Diversion, which also includes a discussion of flows in the East Branch Russian River.

Removal of the Project dams (Scott Dam and Cape Horn Dam) is the primary component of the Proposed Action evaluated. Removal of Project recreation facilities (i.e., campgrounds and day-use areas) and associated access roads located in the Scott Dam Area would not have an effect on hydrology or water use.

Phase 2a: Initial Condition and Preliminary Restoration

Scott Dam to Van Arsdale Diversion

Eel River high-flow hydrology could potentially be affected (increased) downstream of Scott Dam due to implementation of the Proposed Action. As part of rapid dam removal, the adit tunnel plug at the base of Scott Dam would be blasted open (approximately 7,000-cfs capacity) to initiate sediment flushing during the first high-flow season following dam lowering and spillway notching. Rapid removal would follow pre-established protocols related to river flow forecasting. Explosives would be detonated during or preceding an anticipated flood event of sufficient magnitude to evacuate fine sediment deposits from the reservoir (approximately 7,000 cfs; likely between December and March). Following draining of the reservoir, unimpaired flows up to 7,000 cfs would pass through the dam unaffected. Higher flows may be affected by temporary storage and release until the dam is completely removed in the second low-flow season.

When the adit plug is removed, there will be a release of approximately 7,000 cfs or more from Scott Dam for multiple days depending on inflow conditions. Assuming less than 14,000 ac-ft of storage behind the dam when the adit is blasted open, the storage would drain in one day or less; however, the inflow to the dam from the storm would likely be 7,000 cfs or more and last for multiple days. As a result, the release from blasting of the adit would add an additional day of 7,000 cfs to a multiple-day storm event. The No-Action Alternative 1-year, 2-year, 5-year, and 10-year high-flow events at Scott Dam are 304 cfs, 7,420 cfs, 16,500 cfs, and 24,700 cfs, respectively (refer to Section 3.3.1, Table 3.3.1-8). The peak annual inflow at Scott Dam reaches 7,000 cfs in approximately 70 percent of years and reaches 5,000 cfs in approximately 90 percent of years. The release of 7,000 cfs due to adit plug removal would be well within the No-Action high-flow hydrology, and therefore, the Proposed Action would have a negligible effect on high-flow hydrology in the Eel River downstream of Scott Dam.

Removal of the dam would restore flows in the Eel River to unimpaired natural conditions. High flows are similar under existing conditions (No-Action) and the Proposed Action (refer to Section 3.3.1, Figure 3.3.1-18), but low flows would vary substantially. Proposed Action unimpaired low flows would be approximately an order of magnitude lower than the No-Action Alternative (e.g., 10 cfs versus 100 cfs). Stored water would not be present to maintain the current RPA minimum instream flows in the Eel River below Scott Dam. The RPA minimum instream flows would no longer be applicable. Because there are no water users in the Eel River between Scott Dam and the Van Arsdale Diversion, the Proposed Action would have no effect on water users in the river reach.

Van Arsdale Diversion, Cape Horn Dam, and Downstream

Eel River high-flow hydrology could potentially be affected (increased) downstream of Cape Horn Dam due to implementation of the Proposed Action. When the adit plug at Scott Dam is removed, there will be a release of approximately 7,000 cfs from Scott Dam for multiple days depending on inflow conditions (i.e., storm event when the adit plug is removed). Blasting of the adit will add approximately one 7,000-cfs day to the storm event. The No-Action Alternative 1-year, 2-year, 5-year, and 10-year high-flow events in the Eel River at Cape Horn Dam are 307 cfs, 8,962 cfs, 19,149 cfs, and 27,478 cfs, respectively (refer to Section 3.3.1, Table 3.3.1-10). Farther downstream, the high-flow events are much larger. For example, the 5-year flow events at Seward and Scotia are 122,027 cfs and 205,066 cfs, respectively (refer to Section 3.3.1, Tables 3.3.1-12 and 3.3.1-14). The release of 7,000 cfs from Scott Dam due to adit plug removal would be well within the range of No-Action Alternative high-flow events in the river, and therefore, the Proposed Action would have a negligible effect on high-flow hydrology in the Eel River downstream of Cape Horn Dam.

Removal of the dams would restore flows in the Eel River and East Branch Russian River to unimpaired natural conditions. No diversions would occur at the Van Arsdale Diversion / Cape Horn Dam. Removal of Cape Horn Dam would, however, allow other water users (e.g., the Eel-Russian Project Authority) to utilize the area to construct a facility (e.g., the New Eel-Russian Facility) to divert water to the Potter Valley Irrigation District (PVID) and the East Branch Russian River prior to sediment being released from Scott Dam. Below Cape Horn Dam, flows in the Eel River would generally be similar (slightly higher in the winter/spring) under the Proposed Action and existing (No-Action) conditions (refer to Section 3.3.1, Figure 3.3.1-19). The modified flows could affect RPA flows, downstream water users, East Branch Russian River water supply and river flow, and hydropower generation. These potential effects are the same under Phase 2a and Phase 2b. Refer to Phase 2b for a discussion of these potential effects.

Phase 2b: Resulting Conditions and Restoration

Scott Dam to Van Arsdale Diversion

Following removal of Scott Dam, natural (unimpaired) hydrology would pass through the Eel River downstream to Cape Horn Dam. Proposed Action versus No-Action Alternative (existing condition) Eel River flows below Scott Dam are discussed in Section 3.3.1.15 and shown on Figure 3.3.1-18. Figure 3.3.1-18 is reshown here as Figure 3.4.1.2-1. Proposed Action winter/spring flows would be higher and the summer/fall flows would be lower than in the No-Action Alternative. The Proposed Action low flows would be approximately an order of magnitude lower than the No-Action Alternative low flows (e.g., 9 cfs versus 90 cfs). Overall, the Proposed Action will have a beneficial effect on Eel River hydrology by restoring unimpaired flows.

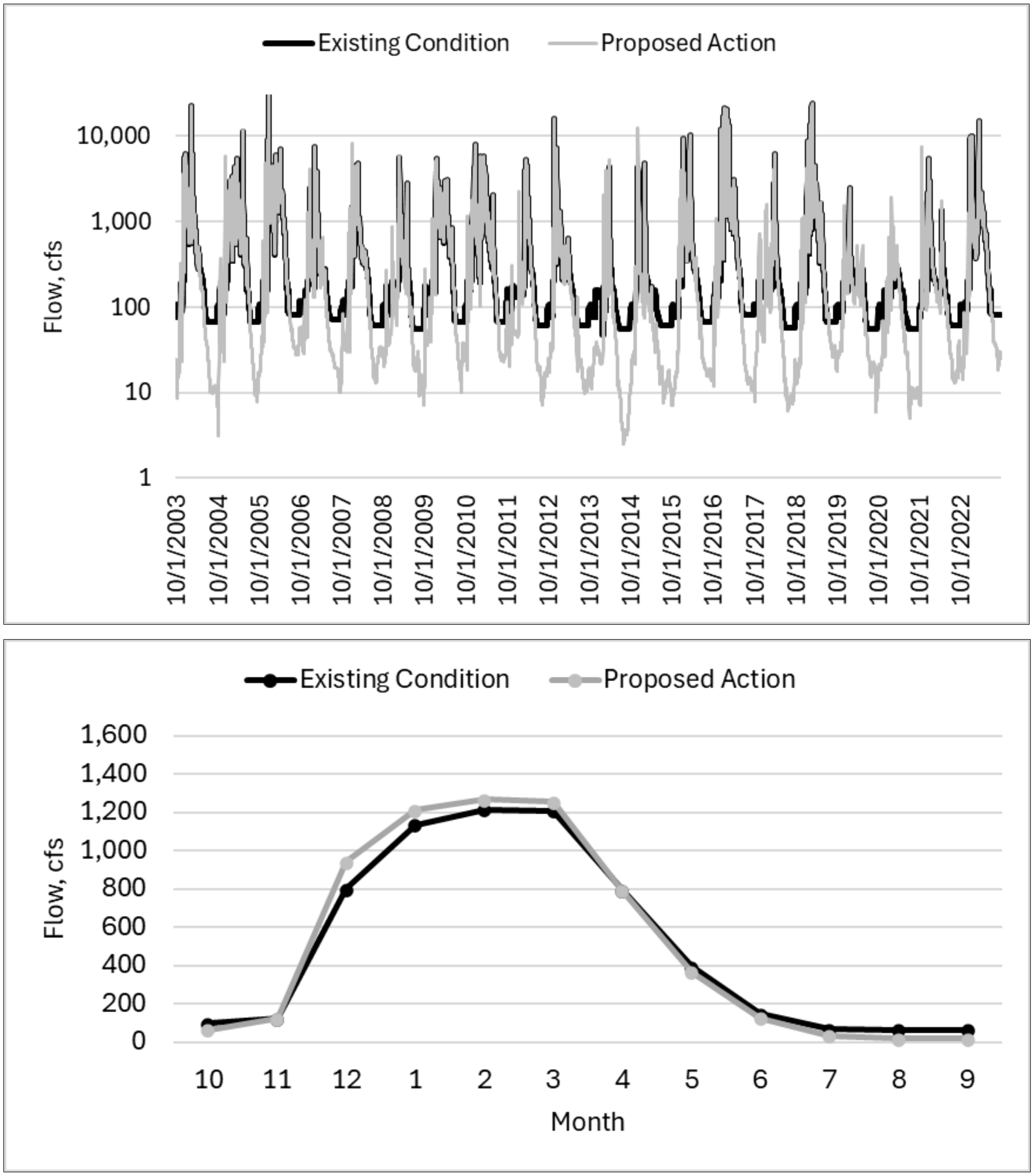


Figure 3.4.1.2-1. Modeled existing (No-Action Alternative) and Proposed Action flows in the Eel River below Scott Dam for the 2004–2023 modeling period of record. Average daily flow (top; log scale) and monthly average flow (bottom; arithmetic scale).

With Scott Dam removed, stored water would not be available to maintain the current RPA minimum instream flows in the Eel River below Scott Dam. The RPA minimum instream flows would no longer be applicable. The intent of the RPA minimum instream flows was to approximately mimic unimpaired flows (e.g., 70 percent of unimpaired flows) in the wet season. With removal of Scott Dam, the Proposed Action would have a beneficial effect on minimum flows, albeit the flows would be significantly lower during the summer/fall than the No-Action Alternative flows.

Because there are no water users in the Eel River between Scott Dam and the Van Arsdale Diversion, the Proposed Action would have no effect on water users in the river reach.

Van Arsdale Diversion, Cape Horn Dam, and Downstream

Following removal of Scott Dam and Cape Horn Dam, natural (unimpaired) hydrology would pass through the Eel River downstream below Cape Horn Dam. Flow in the Eel River below Cape Horn Dam under the Proposed Action compared to flow in the No-Action Alternative (existing condition) are discussed in Section 3.3.1.15 and shown on Figure 3.3.1-19. Figure 3.3.1-19 is reshown here as Figure 3.4.1.2-2. Proposed Action winter/spring flows would be higher and the summer/fall flows would be the same as the No-Action Alternative flows. Overall, the Proposed Action will have a beneficial effect on Eel River hydrology below Cape Horn Dam by restoring unimpaired flows.

With Scott Dam removed, stored water will not be available to maintain the current RPA minimum instream flows in the Eel River below Cape Horn Dam. The RPA minimum instream flows would no longer be applicable. The intent of the RPA minimum instream flows was to approximately mimic unimpaired flows (e.g., 70 percent of unimpaired flows) in the wet season. With removal of Scott Dam, the Proposed Action would have a beneficial effect on minimum flows.

There are water rights holders along the Eel River from Van Arsdale Reservoir downstream to the ocean (approximately 63 active; state, PG&E, individuals, corporations) that could potentially be affected by changes in Eel River hydrology. Overall, however, limited amounts of irrigable land exist along the river. Because there is minimal change in Eel River hydrology, the Proposed Action would have a negligible effect on water users in the river reach.

Altered hydrology in the Eel River would substantially affect flows in the East Branch Russian River. Under the Proposed Action, there would be no diversions from the Eel River to the East Branch Russian River and East Branch Russian River flows would return to natural (unimpaired) conditions. Modeled PVID water supply under the No-Action Alternative is shown on Figure 3.4.1.2-3. This water supply would not be available under the Proposed Action. Potter Valley is located at the top of the East Branch Russian River, and there is very little natural water supply in the valley. There would be an unavoidable adverse effect on the PVID water supply. Releases to the East Branch Russian River channel would also be lost. Under the Proposed Action, there would be an unavoidable adverse effect on existing condition hydrology but a return to unimpaired flow conditions in the East Branch Russian River compared to the No-Action Alternative.

Under the No-Action Alternative, power generation is not occurring at the Potter Valley Powerhouse. A transformer has been out of service and has not been replaced due to the license surrender. The Potter Valley Powerhouse has not generated power since May 2021 (refer to Section 3.3.1.16). In the 5 years prior, the average annual generation was 16,195 megawatt-hours (refer to Section 3.3.1.16, Table 3.3.1-18). The Proposed Action would result in no loss of generation, as there is no generation in the existing condition No-Action Alternative.

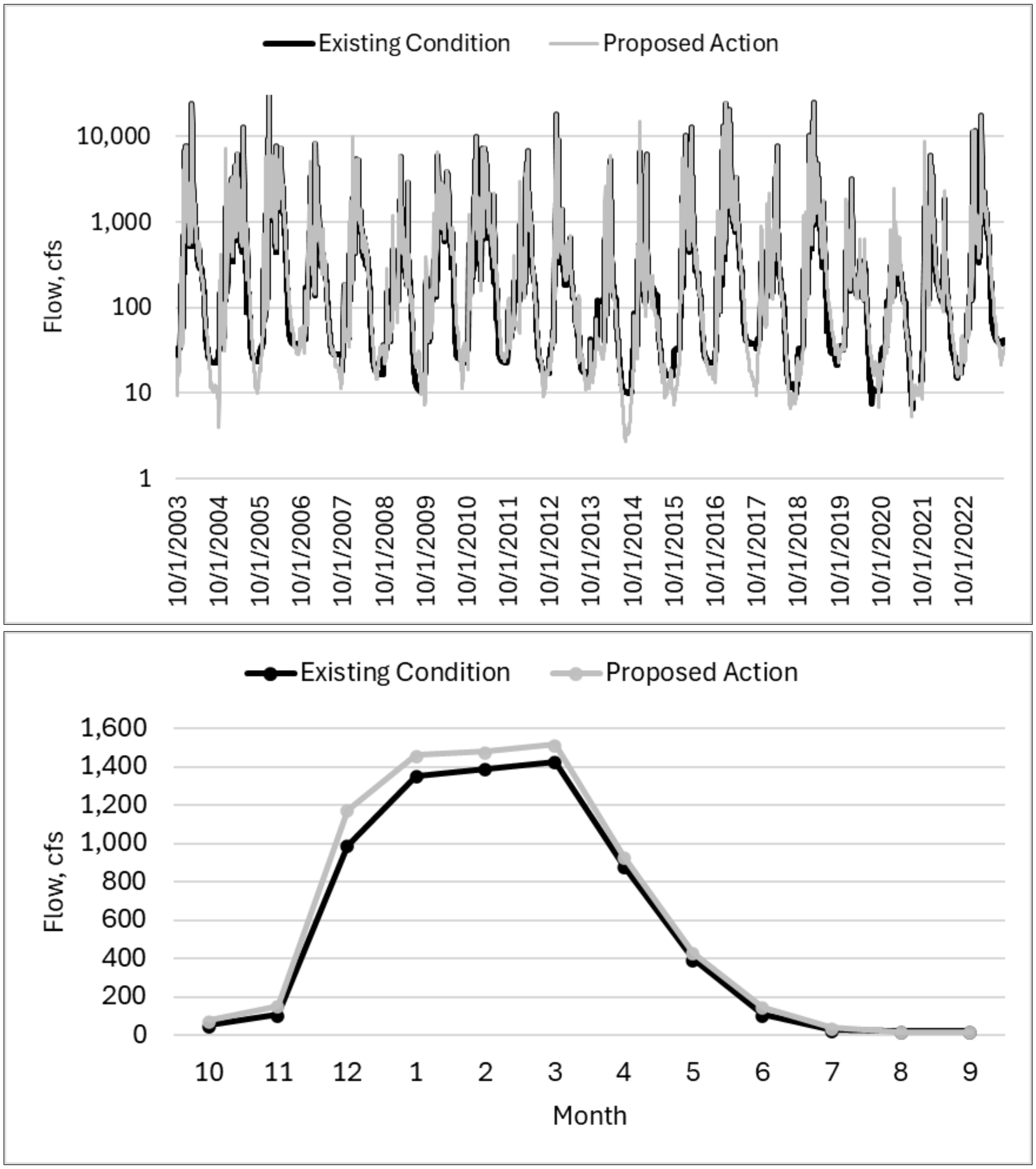


Figure 3.4.1.2-2. Modeled existing (No-Action Alternative) and Proposed Action flows in the Eel River below Cape Horn Dam for the 2004–2023 modeling period of record. Average daily flow (top; log scale) and monthly average flow (bottom; arithmetic scale).

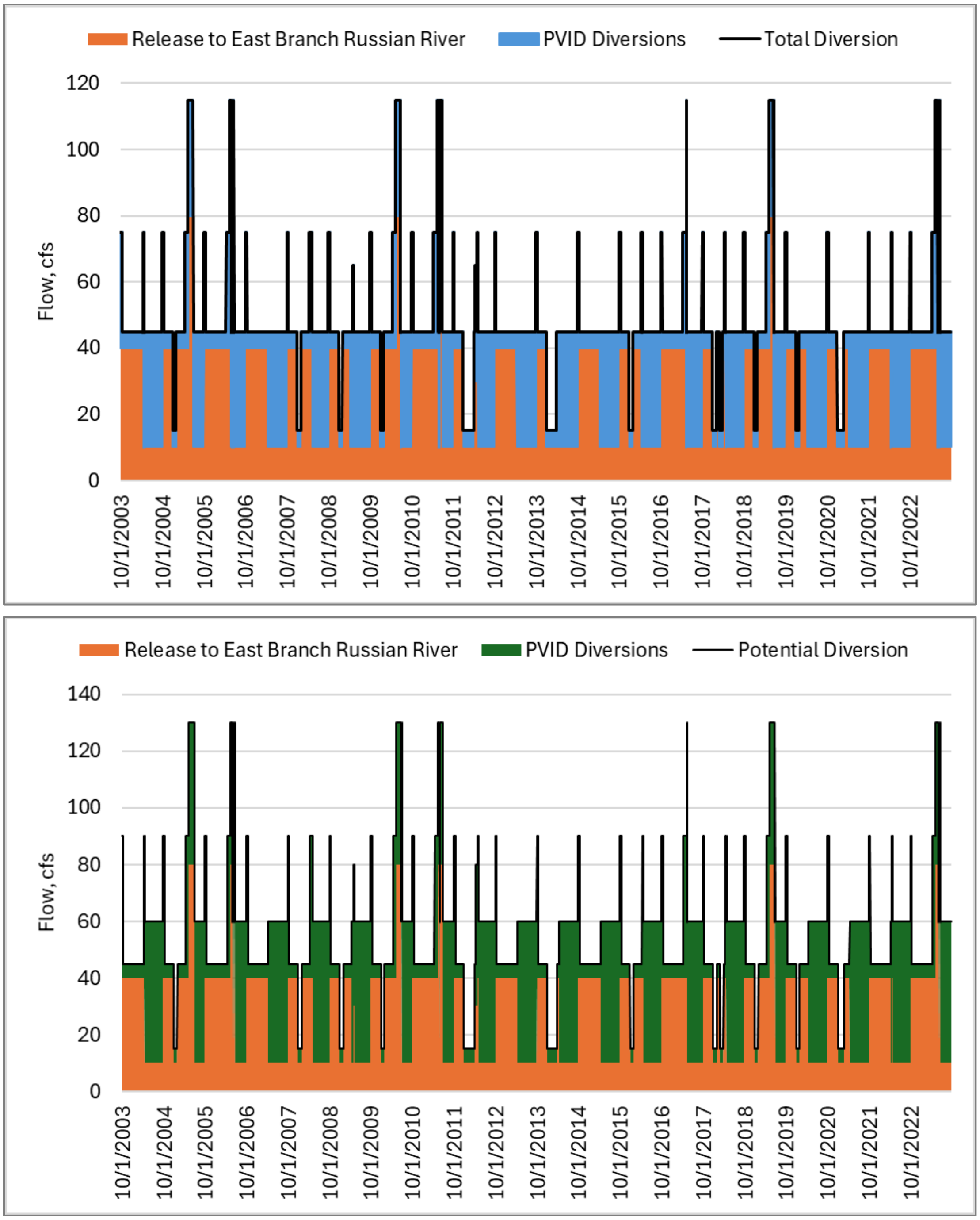


Figure 3.4.1.2-3. Modeled existing (No-Action Alternative) flow releases into the East Branch Russian River with PVID average diversions (top) and modeled existing flow release with PVID maximum diversions (bottom).

Dam Removal Sequencing Options

Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: alternate sequencing option 1, if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam, and alternate sequencing option 2, if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1). This is in contrast to the Proposed Action whereby PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season and remove the adit plug at Cape Horn Dam and Cape Horn Dam cofferdams simultaneously or in close sequence to flush sediment from the reservoirs.

Alternate Sequencing Option 1

Phase 1: Construction Effects

The Phase 1 construction-related effects to water use and hydrology of the alternate sequencing option 1 (removing Scott Dam prior to Cape Horn Dam removal) would be the same as for the Proposed Action. The same construction environmental measures would be implemented under the Proposed Action and alternate sequencing option 1. With the implementation of these measures, the Proposed Action would have no effect on minimum flow compliance and would have a beneficial effect on hydrology by facilitating the release of unimpaired flows into the Eel River.

Phase 2a: Initial Condition and Preliminary Restoration

The removal of the Scott Dam adit plug a year prior to the removal of Cape Horn Dam would generally affect Eel River hydrology similarly to the Proposed Action sequencing. Flows released from the adit plug into the Eel River would pass through the Cape Horn Dam Area and would continue downstream. High flows would be within the range of existing high-flow events. However, sediment from the Scott Dam flow release would potentially bury the Van Arsdale Diversion Intake, reducing or eliminating the ability to divert flow to the East Branch Russian River. While the Proposed Action includes removal of Cape Horn Dam and cessation of PG&E diversions to the East Branch Russian River, the sediment at Cape Horn Dam would preclude other water users (e.g., the Eel-Russian Project Authority) from utilizing the area to construct a facility (e.g., the New Eel-Russian Facility) to divert water until the sediment was cleaned up and removed. This could have an adverse effect on diversions to the PVID and East Branch Russian River for a season compared to the Proposed Action sequencing removal of both dams during the same season.

Phase 2b: Resulting Conditions and Restoration

The Phase 2b–related effects to water use and hydrology of the alternate sequencing option 1 (removing Scott Dam prior to Cape Horn Dam removal) would be the same as for the Proposed Action but with delayed timing. Alternate sequencing option 1 would restore hydrology to natural unimpaired conditions in years 2+ of the Project, as compared to natural conditions being restored at the end of year 1 for the Proposed Action. With removal of the dams and recreation facilities, the effects to water use and hydrology would be beneficial in the Eel River. In the East Branch

Russian River, however, the Proposed Action would have an unavoidable adverse effect on water use and hydrology.

Alternate Sequencing Option 2

Phase 1: Construction Effects

The Phase 1 construction-related water use and hydrology effects of the alternate sequencing option 2 (removing Cape Horn Dam prior to Scott Dam removal) option would be the same as for the Proposed Action. The same construction and environmental measures would be implemented under the Proposed Action and alternate sequencing option 2. With the implementation of these measures, the effects to water use and hydrology would be negligible in the Eel River and East Branch Russian River.

Phase 2a: Initial Condition and Preliminary Restoration

Under alternate sequencing option 2 in which Cape Horn Dam is removed (including the cofferdams) prior to the removal of Scott Dam, the overall effect on water use and hydrology would be similar to the Proposed Action but would be split between two years. Early removal of Cape Horn Dam would eliminate the ability to divert flow to the East Branch Russian River. It would, however, allow other water users (e.g., the Eel-Russian Project Authority) to utilize the area to construct a facility (e.g., the New Eel-Russian Facility) to divert water to the PVID and East Branch Russian River prior to sediment being released from Scott Dam. Subsequent release of high flows from Scott Dam would be within the range of existing high-flow events. Overall, alternate sequencing option 2 would restore flows in the Eel River to unimpaired natural conditions.

Phase 2b: Resulting Conditions and Restoration

The Phase 2b–related effects to water use and hydrology of the alternate sequencing option 2 (removing Cape Horn Dam prior to Scott Dam removal) option would be the same as for the Proposed Action, but with delayed timing. Alternate sequencing option 2 would restore hydrology to natural unimpaired conditions in years 2+ of the Project, as compared to natural conditions being restored at the end of year 1 for the Proposed Action. With removal of the dams and recreation facilities, the effects to water use and hydrology would be beneficial in the Eel River. In the East Branch Russian River, however, the Proposed Action would have an unavoidable adverse effect on water use and hydrology.

Construction and Environmental Measures

To avoid or reduce effects to water use and hydrology during construction, PG&E will obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Construction Site Water Diversion, Dewatering, and Drawdown Plan
- East Branch Russian River Diversion Plan

Unavoidable Adverse Effects

The following unavoidable adverse effects to water use and hydrology related to Project facility modifications implemented under the Proposed Action would occur:

- Unavoidable adverse effect on the PVID water supply because diversions to the East Branch Russian River would no longer occur under the Proposed Action; and
- Unavoidable adverse effect on existing condition hydrology in the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action, but flows would return to natural conditions.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Acronyms

°C	degrees Celsius
ac-ft	acre-feet
BMP	best management practice
BOD	biological oxygen demand
cfs	cubic foot/feet per second
COD	chemical oxygen demand
E	existing
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mi.	miles
mm	millimeters
NERF	New Eel-Russian Facility
P	potential
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

RPA	Reasonable and Prudent Alternative
SPCC	Spill Prevention, Control, and Countermeasures
SVOC	semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TPCM	two-phase conceptual model
TPH	total petroleum hydrocarbons
USGS	U.S. Geological Survey
$yd.^3$	cubic yards

3.4.1.3 Water Quality

This section describes the potential effects to water quality that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the changes in water quality that may result from activities to be implemented under the Proposed Action (Section 2.2) compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

It is anticipated that removal of Scott Dam would each require two low-flow and one intervening high-flow seasons to complete. It is anticipated that removal of Cape Horn Dam would require one low-flow season to complete. The low-flow construction season would extend from approximately June 1 to October 31 depending on weather conditions. Construction activities would likely be sequenced such that construction would occur at both sites at the same time; however, below, construction is analyzed in a general way in the event the activities are not linked temporally.

Removal and restoration of Project recreational facilities would occur during the same seasons as dam removal (e.g., campgrounds, day-use facilities, recreation access roads and trails, kiosk, and boat ramps) located on U.S. Forest Service and PG&E lands.

Final effects determinations consider construction measures and post-facility removal measures included to avoid or mitigate impacts associated with the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

The area of analysis for water quality includes Lake Pillsbury; Van Arsdale Reservoir; the Eel River from Lake Pillsbury downstream to the estuary; the East Branch Russian River from the Potter Valley Powerhouse tailrace downstream to Lake Mendocino; and the marine intertidal, tidal, and oceanic habitats between the mouth of the Eel River estuary and the open ocean (see Map 3.3.2-1).

Phase 1: Short-term Construction Effects

The following potential effects to water quality associated with Project facility modifications were evaluated:

- Potential change in Eel River water quality during construction activities (e.g., turbidity, water temperature, pH); and
- Potential change in East Branch Russian River water quality during construction activities (e.g., turbidity, water temperature, pH).

This section relies on data presented in Section 3.3.2, Water Quality.

Under the Proposed Action, the following actions would occur that could affect water quality:

- Decommissioning and removal of Scott and Cape Horn dams and associated facilities and features;
- Removal and restoration of Project recreational facilities (e.g., campgrounds, day-use facilities, recreation access roads and trails, kiosk, and boat ramps) located on U.S. Forest Service and PG&E lands;
- Diversion flows during decommissioning of the dams; and
- Drawdown of Lake Pillsbury prior to the removal of Scott Dam.

Analysis of the construction water quality effects is based on the Conceptual Decommissioning Plan (Section 2.2.1.1).

Water Quality Categories

Construction activities associated with Project facility modifications have the potential to temporarily impact water quality, including increases in turbidity and suspended sediment due to sediment disturbance, introduction of pollutants as a result of accidental spill, and contamination associated with stormwater runoff from construction staging and stockpile areas. These impacts are discussed below and further organized by construction site later in the section.

- **Increase in Turbidity and Suspended Solids**: Construction activities may cause a temporary increase in turbidity and suspended solids in the Eel River or East Branch Russian River due to ground disturbance from excavation and earthmoving, clearing and grading, dam deconstruction, installation of access roads / river crossings, bank stabilization around the dams, and stormwater runoff. Erosion and destabilization of soils could also result from use of heavy equipment, personnel, and light vehicle traffic, increasing the susceptibility of movement of soils into the Eel River or diversion into the East Branch Russian River. Dewatering of the reservoirs and dredging could potentially cause releases of sediment.

- **Increase in Pollutant Spill Risk**: Construction activities include the use of a variety of chemicals such as fuels, lubricants, paints, solvents, and construction materials. Improper handling, storage, or accidental spills of these chemicals could result in pollutants entering soil or surface water if not managed correctly. Activities associated with Project facility modifications could increase the potential for accidental spills and pollutants to be introduced into the Eel River or East Branch Russian River.
- **Contamination from Stormwater Runoff**: Construction activities, including dam removal and establishment of staging and stockpile areas, could temporarily alter natural drainage patterns. Without proper stormwater management practices such as silt fencing, straw/hay bales, or vegetative buffers, runoff from rainfall events could transport pollutants from the construction site into the Eel River or East Branch Russian River.
- **Contamination from Human Waste**: Construction activities include installation of sanitary facilities (e.g., portable toilets) to support workers. Bacteria, nutrients, and other contaminants from human waste and sanitation systems can enter surface water or groundwater if the system is not properly designed and operated or if sanitation facilities are not provided.
- **Modified Water Temperature**: Construction activities include drawdown of Lake Pillsbury. The Lake Pillsbury cold-water pool provides cold summer flow releases into the Eel River downstream of Scott Dam. The cold-water flows maintain cold-water species between Scott Dam and Cape Horn Dam and affect water temperature in the East Branch Russian River.
- **Dissolved Oxygen Depletion:** Construction activities may cause a temporary increase in turbidity and suspended solids in the Eel River or East Branch Russian River. High turbidity, particularly when the sediment is anoxic and contains chemical oxygen demand (COD) (oxygen required to oxidize inorganic chemicals) and biological oxygen demand (BOD) (oxygen consumed by living organisms, e.g., bacteria), can result in significant impacts to dissolved oxygen.

Scott Dam Area – Dam Removal

Scott Dam construction activities would occur within an area located upstream and downstream of the dam. The work area would include staging and stockpile areas, portable sanitary facilities, and designated refueling areas. Water drawdown of the reservoir would occur using 400 cubic feet per second (cfs) capacity of the low-level outlet needle valve. A temporary access road and barge launch would be installed below the dam. An adit tunnel and channel would be constructed in the base of the dam/spillway. The upper portion of the dam would be removed (dam lowering and notching), and clean rubble would be placed in the plunge pool area. Sediment would be dredged from the upstream side of the dam at the location of the adit tunnel to facilitate sediment flushing when the adit plug is removed. The adit plug would be blasted open during high flows and allow flushing of sediment from Lake Pillsbury. Subsequent to the flushing, the remaining dam and facilities would be removed and the bulk of the dam material would be stored and capped on PG&E lands.

Increase in Turbidity and Suspended Sediment

Construction activities at Scott Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam. Draining the reservoir may result in scour of the Lake Pillsbury inlet channel sediments and generate suspended sediment / turbidity in the reservoir water and the outflow to the Eel River. Dredging of sediment in front of the adit (upstream side of the dam) could also generate turbidity that could be released into the river. Disposal of contaminated or dirty / crushed concrete debris into the plunge pool area could create downstream water quality issues. Some level of increase in turbidity and suspended sediment release into the Eel River may be unavoidable, particularly with drawdown of the reservoir and lowering of the dam. Flows over the dam or through the low-level outlet may be elevated in turbidity and suspended sediment compared to reference conditions upstream of the reservoir.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations in the vicinity of Scott Dam. Construction measures include a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; best management practices (BMPs), and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the potential for increase in turbidity and suspended sediment and related water quality effects would be reduced in in Lake Pillsbury and the Eel River below Scott Dam; however, it is anticipated there may be unavoidable adverse effects to turbidity and suspended sediment in Lake Pillsbury and the Eel River downstream of Cape Horn Dam.

Significant adverse effects to water quality from high turbidity and suspended sediment concentrations are expected when the adit plug at Scott Dam is removed (reservoir sediment flushing), which is discussed in Phase 2a: Initial Conditions and Preliminary Restoration.

Increase in Pollutant Spill Risk

Construction activities at Scott Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam due to pollutant spill risk. Activities associated with construction could increase the potential for accidental spills and pollutants to be introduced into Lake Pillsbury and the Eel River.

PG&E would implement hazardous materials handling measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan with protocols for preventing spills and managing incidents should they occur. In addition, PG&E would obtain applicable resource agency and construction permits. With adherence to the SPCC Plan, construction-related BMPs, and construction permits, potential effects from pollutant spill contamination from construction are reduced to a negligible level in the Eel River below Scott Dam.

Contamination from Stormwater Runoff

Construction activities at Scott Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam due to contamination from stormwater runoff. Without proper stormwater management practices such as silt fencing, straw/hay bales, or vegetative buffers, runoff from rainfall events could also transport pollutants or sediment (turbidity / suspended sediment) from the construction site into the Eel River.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations. Construction measures include a Stormwater Pollution Prevention Plan (SWPPP) and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for contamination from stormwater runoff and related water quality effects are considered negligible in the Eel River below Scott Dam. With implementation of these measures, the effect of construction on water quality in the Eel River below Scott Dam due to contamination from stormwater runoff would be negligible.

Contamination from Human Waste

Construction activities at Scott Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam due to contamination from human waste. Bacteria, nutrients, and other contaminants from human waste and sanitation systems can enter surface water or groundwater if the system is not properly designed and operated or if sanitation facilities are not provided.

PG&E would include measures for containment of human waste that would be implemented at all construction activity locations. Construction measures include provision of portable toilets with secondary containment. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the effect of construction on water quality in the Eel River below Scott Dam due to contamination from human waste would be negligible.

Modified Water Temperature

Construction activities at Scott Dam have the potential to affect water temperature in the Eel River downstream of the dam. Early drawdown of Lake Pillsbury has the potential to increase water temperatures in the late summer/fall period due to the earlier release of the cold-water pool. Drawdown of Lake Pillsbury is scheduled to begin in May (prior to the beginning of construction activities), reaching 10,000 acre-feet (ac-ft) of storage by the end of October. This drawdown is similar to storage conditions in 2015, when storage reached a minimum of 12,600 ac-ft around the beginning of December. It is possible that early drawdown could exacerbate cold-water pool loss and summer/fall water temperature.

Water temperature conditions below Lake Pillsbury during construction are likely to be similar to those observed in the fall and winter of 2015/2016. Maximum daily average water temperature in the Eel River below Scott Dam was 22.4 degrees Celsius (°C) in 2015. The annual maximum daily average water temperature at that location was similar in 2013, 2016, 2017, and 2020, all of which were above 22°C. Based on this historical information, it can be concluded that temperatures would at a minimum be above average due to the early and more extreme than usual drawdown. They would still fall within the bounds of numerous recent historical years if drawdown is managed properly. The Construction Site Water Diversion, Dewatering, and Drawdown Plan would include a measure to manage drawdown and, if necessary, identify construction measures to release surface water in combination with the cold-water pool to reduce potential temperature effects. Therefore, with implementation of the Construction Site Water Diversion, Dewatering, and Drawdown Plan, the effect of construction activities on water temperature in the Eel River below Scott Dam would be negligible.

Dissolved Oxygen Depletion

Construction activities at Scott Dam have the potential to affect dissolved oxygen levels in the Eel River downstream of the dam. Draining the reservoir may result in scour of the Lake Pillsbury inlet channel sediments and generate suspended sediment / turbidity in the reservoir water and the outflow to the Eel River. Dredging of sediment in front of the adit (upstream side of the dam) could also generate turbidity that could be released into the river. High turbidity and disturbing sediments high in BOD and COD can lead to depletion of dissolved oxygen in the water column.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations in the vicinity of Scott Dam. Construction measures include a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; BMPs, and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the potential for depletion of dissolved oxygen due to increases in turbidity and suspended sediment would be negligible in Lake Pillsbury and the Eel River below Scott Dam.

Significant adverse effects to dissolved oxygen are expected when the adit plug at Scott Dam is removed, which is discussed in Phase 2a: Initial Conditions and Preliminary Restoration.

Scott Dam Area – Recreation Facility Removal

All Project recreation facilities (i.e., campgrounds and day-use areas) and associated access roads and trails would be removed, and the sites would be restored. The removal includes six campgrounds (Fuller Grove, Navy, Oak Flat, Pogie Point, Sunset, and Fuller Grove Group) and associated roads, three day-use areas with boat launches (Fuller Grove, Pillsbury Pines, Lake Pillsbury Low Level), and associated roads and trails. A site-specific engineering design would be developed for recreation facilities. The design would include plans to remove any restroom facilities.

Increase in Turbidity and Suspended Sediment

Construction activity related to the removal of Project recreation facilities has the potential to affect water quality in Lake Pillsbury and the Eel River due to the location of the construction area near Lake Pillsbury and the potential for disturbing soils and reservoir sediments (boat ramp removals).

PG&E would include water quality and erosion control measures that would be implemented at the recreation facility removal locations. Construction measures include BMPs, a Construction Water Quality and Water Temperature Monitoring Plan, and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for increase in turbidity and suspended sediment and related water quality effects are negligible in Lake Pillsbury and the Eel River.

Increase in Pollutant Spill Risk

Construction activity related to the removal of Project recreation facilities has the potential to affect water quality in Lake Pillsbury and the Eel River due to an increased risk of pollutant spill. Activities associated with deconstruction could increase the potential for accidental spills and pollutants to be introduced into Lake Pillsbury and the Eel River due to the use of equipment, fuel, and other hazardous materials.

PG&E would implement hazardous materials handling measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing an SPCC Plan with protocols for preventing spills and managing incidents should they occur. In addition, PG&E would obtain applicable resource agency and construction permits. With adherence to the SPCC Plan, construction-related BMPs, and construction permits, potential effects from pollutant spill contamination from construction are reduced to a negligible level in Lake Pillsbury and the Eel River.

Contamination from Stormwater Runoff

Construction activity related to the removal of Project recreation facilities has the potential to affect water quality in Lake Pillsbury and the Eel River due to contamination from stormwater runoff. Removal of sites would disturb soils and make them susceptible to erosion. Similarly, stockpiled materials may be susceptible to erosion during storm events.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations. Construction measures include an SWPPP and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the impact of construction on water quality in Lake Pillsbury and the Eel River due to contamination from stormwater runoff would be negligible.

Contamination from Human Waste

Construction activity related to the removal of Project recreation facilities has the potential to affect water quality in Lake Pillsbury and the Eel River due contamination from human waste. Bacteria, nutrients, and other contaminants from human waste and sanitation systems can enter surface water or groundwater if the system is not properly designed and operated, if sanitation facilities are removed, or if sanitation facilities are not provided for workers.

PG&E would include measures for containment of human waste that would be implemented at all construction activity locations. Construction measures include provision of portable toilets with secondary containment. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the impact of construction on water quality in Lake Pillsbury and the Eel River due to contamination from human waste would be negligible.

Modified Water Temperature

No in-water work is proposed as part of the removal of Project recreation facilities, and therefore, this phase of the Project would have no effect on water temperature.

Dissolved Oxygen Depletion

Construction activity related to the removal of Project recreation facilities has limited potential to affect dissolved oxygen in Lake Pillsbury and the Eel River due to the location of the construction area near Lake Pillsbury and the potential for disturbing soils and reservoir sediments (boat ramp removals) that could impact dissolved oxygen levels.

PG&E would include water quality and erosion control measures that would be implemented at the recreation facility removal locations. Construction measures include BMPs, a Construction Water Quality and Water Temperature Monitoring Plan, and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for dissolved oxygen depletion due to increases in turbidity and suspended sediment are negligible in Lake Pillsbury and the Eel River.

Cape Horn Dam Area

Cape Horn Dam construction activities would occur within an area located upstream and downstream of the dam. The work area would include staging and stockpile areas, portable sanitary facilities, and designated refueling areas. A temporary access road would be constructed, and a flow bypass channel would be constructed with an upstream cofferdam that would be removed when the channel is completed. Two channel-spanning cofferdams would be installed, one upstream and the other downstream of the dam. The work area between the cofferdams would be drained with pumps, and sediment would be removed and placed on PG&E lands for disposal. The concrete dam, the earthen portion of the dam, and the fish hotel / exclusion barrier would be removed. Concrete and dirt materials would be stored on PG&E land above the 100-year floodplain. At the end of construction, the cofferdams would be removed and sediment (as much as 640,000 to 1,700,000 cubic yards [$yd.^3$]) from upstream of the upstream cofferdam would flow downstream into the Eel River. For a discussion of the effects of cofferdam removal, see the Phase 2a discussion below.

Trout Creek Campground and the associated road, near Van Arsdale Reservoir, would be transferred to a third party, and therefore, no construction would occur in this area.

Increase in Turbidity and Suspended Sediment

Construction activities in the vicinity of Cape Horn Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam. Construction of the diversion channel, installation of two cofferdams, dewatering of the work area between the two cofferdams, and removal and disposal of sediment from the dewatered work area could all result in increased suspended sediment concentrations downstream in the Eel River.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations in the vicinity of Cape Horn Dam. Construction measures include a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; BMPs; and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for increase in turbidity and suspended sediment and related water quality effects are negligible in the Eel River below Cape Horn Dam.

Increase in Pollutant Spill Risk

Construction activities in the vicinity of Cape Horn Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam due to pollutant spill risk. Activities associated with construction could increase the potential for accidental spills and pollutants to be introduced into Lake Pillsbury and the Eel River.

PG&E would implement hazardous materials handling measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing an SPCC Plan with protocols for preventing spills and managing incidents should they occur. In addition, PG&E would obtain applicable resource agency and construction permits. With adherence to the SPCC Plan, construction-related BMPs, and construction permits, potential effects from pollutant spill contamination from construction are reduced to a negligible level in the Eel River below Cape Horn Dam.

Contamination from Stormwater Runoff

Construction activities in the vicinity of Cape Horn Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam due to contamination and erosion (turbidity and suspended sediment) from stormwater runoff. Without proper stormwater management practices such as silt fencing, straw/hay bales, or vegetative buffers, runoff from rainfall events could also transport pollutants from the construction site into the Eel River.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations. Construction measures include an SWPPP and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the effect of construction on water quality in the Eel River below Cape Horn Dam due to contamination from stormwater runoff would be negligible.

Contamination from Human Waste

Construction activities in the vicinity of Cape Horn Dam have the potential to temporarily affect water quality in the Eel River downstream of the dam due to contamination from human waste. Bacteria, nutrients, and other contaminants from human waste and sanitation systems can enter surface water or groundwater if the system is not properly designed and operated or if sanitation facilities are not provided.

PG&E would include measures for containment of human waste that would be implemented at all construction activity locations. Construction measures include provision of portable toilets with secondary containment. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the effect of construction on water quality in the Eel River below Cape Horn Dam due to contamination from human waste would be negligible.

Modified Water Temperature

Construction activities in the vicinity of Cape Horn Dam have the potential to temporarily affect water temperature in the Eel River downstream of the dam. Water would no longer be stored behind the dam, and flows would be routed around the construction area and returned to the river below the lower cofferdam. However, due to the very small storage capacity of Van Arsdale Reservoir (700 ac-ft), the difference in water temperature observed in the Eel River below Cape Horn Dam under existing conditions (with the dam in place) and during the construction phase (with flows routed around the construction area) is expected to be negligible. Therefore, the effect of construction in the vicinity of Cape Horn Dam on water temperatures in the Eel River below Cape Horn Dam would be negligible.

Dissolved Oxygen Depletion

Construction activities in the vicinity of Cape Horn Dam have the potential to temporarily affect dissolved oxygen in the Eel River downstream of the dam. Construction of the diversion channel, installation of two cofferdams, dewatering of the work area between the two cofferdams, and removal and disposal of sediment from the dewatered work area could all result in increased suspended sediment concentrations downstream in the Eel River that could affect dissolved oxygen levels in the river.

PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations in the vicinity of Cape Horn Dam. Construction measures include a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; BMPs; and a Construction Erosion Prevention Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for dissolved oxygen depletion due to increases in turbidity and suspended sediment are negligible in the Eel River below Cape Horn Dam.

East Branch Russian River

During deconstruction of Scott Dam and Cape Horn Dam, storage water and/or diversion capacity at the Van Arsdale diversion may not be available to maintain the current Reasonable and Prudent Alternative (RPA) minimum flows in the Eel River or East Branch Russian River. Following the completion of the Lake Pillsbury drawdown in October, no storage would be available to maintain the RPA minimum flows in the event of low inflow to Lake Pillsbury. Resulting low flows in the East Branch Russian River could increase water temperatures. Also, if water quality in the Eel River is affected by Scott Dam or potentially Cape Horn Dam construction in a way that affects the water quality diverted to the East Branch Russian River, water quality in the East Branch Russian River could be affected.

PG&E would develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. PG&E would also include water quality and erosion control measures that would be implemented at the Scott Dam and Cape Horn Dam construction locations. Construction measures include BMPs, a Construction Erosion Prevention Plan, an SWPPP, and an SPCC Plan, and PG&E would obtain applicable resource agency and construction permits. With the implementation of these mitigation measures, the impact on water temperature and water quality in the East Branch Russian River would be negligible.

Phase 2: Post-facility Removal Effects

Phase 2a: Initial Conditions and Preliminary Restoration

The potential effects to water quality during and following deconstruction of Scott Dam and Cape Horn Dam include the following:

- Fine sediment transport in the Eel River during and following removal of Scott Dam and of Cape Horn Dam (turbidity, suspended sediment);
- Potential release of toxic sediment (e.g., heavy metals or other contaminants);
- Change in water quality in the Eel River during and after dam removal (e.g., dissolved oxygen, nutrients, chlorophyll-a, algal toxins, pH, alkalinity, temperature);
- Contamination from application of herbicides for treatment of invasive weeds in restored riverbeds; and
- Beneficial uses.

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Cape Horn Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after the sediment flushing. The majority of removal activities at Cape Horn Dam would occur during the first low-flow season.

The discussion of effects in the following sections assume that Scott Dam and the Cape Horn Dam cofferdams would be breached simultaneously. Discussions of alternate 1 and alternate 2 construction sequencing and how effects from these approaches differ are discussed in subsequent sections.

Mainstem Eel River – Scott Dam and Cape Horn Dam Removal

Lake Pillsbury contains approximately 21 million yd.^{3} of sediment (primarily silt and clay), and an estimated 12 million yd.^{3} could potentially be mobilized downstream of Scott Dam following rapid dam removal. The adit tunnel plug at the base of the dam would be blasted open (approximately 7,000-cfs capacity) to initiate sediment flushing during the first high-flow season following dam lowering and notching. Rapid removal would follow pre-established protocols related to river flow forecasting. Explosives would be detonated during or preceding an anticipated flood event of sufficient magnitude to evacuate fine sediment deposits from the reservoir (likely between December and March).

Van Arsdale Reservoir is relatively small (originally 1,140 ac-ft) but contains approximately 1.7 million yd.^{3} of sediment (primarily coarser sediment) that could potentially be mobilized downstream of Cape Horn Dam following the removal of cofferdams following dam removal. The cofferdams constructed upstream and downstream of Cape Horn Dam would be removed at the same time as the adit blast would occur in Scott Dam. Sediment from both reservoirs would be released downstream almost simultaneously.

Increase in Turbidity and Suspended Sediment

Removal of Scott Dam following the blasting of the adit at the base of the dam would result in a large flush of sediment in the Eel River below Scott Dam. Following draining of the reservoir, erosion of the bare, relatively fine sediment could produce fine sediment transport into the Eel River, increasing suspended sediment and turbidity.

Stillwater Sciences (2021a) developed a two-phase conceptual model (TPCM) for fine sediment erosion of the bottom-set sediment deposit (sediment in the reservoir versus coarser sediment at the reservoir inlets) following rapid base-level control lowering due to draining of Lake Pillsbury following dam removal. The results of the TPCM are presented for three different discharge scenarios in Table 3.4.1.3-1. The duration of erosion of 12 million yd.^{3} of Phase 1 erosion[1] fine sediment is calculated to take from 0.8 day at a discharge of 5,000 cfs to 7.7 days if the discharge is only 1,000 cfs. The calculated sediment concentration at a discharge of 5,000 cfs (900,000 milligrams per liter [mg/L]) is nearly twice as high as at 1,000 cfs (457,800 mg/L). Concentrations are expected to decrease downstream; for example, Stillwater Sciences (2021b) assumed about 30 percent diluted at the Middle Fork Eel River. Discharge of the Middle Fork Eel River was between 0.9 and 12.2 times greater than the Eel River discharge at Cape Horn Dam. Table 3.4.1.3-2 shows monthly average flow dilution factors along the length of the Eel River. Dilution at Scotia would be about 92 percent (600,000 mg/L at Scott Dam would be 48,000 mg/L at Scotia).

[1] See description of Stillwater Sciences (2021a) Phase 1 erosion and Phase 2 erosion in Section 3.4.1.8.

The assumptions used in the TPCM were conservative (all the sediment was assumed to be fine grain sediment, whereas it is composed of both fine and coarse sediment), and therefore, it is possible that actual suspended sediment concentrations might be less than modeled.

Table 3.4.1.3-1. Modeled magnitude of suspended sediment concentration and duration for fine sediment erosion during dam removal.

Water Discharge (cfs)	1,000	2,000	5,000
Maximum suspended sediment concentration (mg/L)	457,800	612,500	900,000
Duration of Phase 1 erosion (days)	7.7	2.9	0.8

Source: Table 1 in Stillwater Sciences (2021a)

Table 3.4.1.3-2. Hydrology-based suspended sediment concentration dilution factors for the Eel River (1925–2023 hydrology; see Section 3.3.1).

Month	Eel River Mean Monthly Flow and Dilution Factor (concentration original X dilution factor = new concentration)											
	Scott Dam (RM 168.5)		Cape Horn Dam (RM156.7)		Below MF Eel River Confluence (RM 119.3)		Fort Seward (RM ca. 64)		Scotia (RM20.8)		Eel River Estuary (RM7.0)	
	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor
October	58	--	63	0.92	264	0.22	486	0.12	724	0.08	838	0.07
November	275	--	326	0.84	1,609	0.17	2,839	0.1	4,732	0.06	5,436	0.05
December	976	--	1,132	0.86	5,228	0.19	9,595	0.1	14,664	0.07	16,366	0.06
January	1,435	--	1,728	0.83	7,518	0.19	12,910	0.11	19,870	0.07	22,089	0.06
February	1,537	--	1,867	0.82	7,561	0.2	12,193	0.13	19,812	0.08	21,935	0.07
March	1,220	--	1,427	0.85	5,876	0.21	10,282	0.12	15,181	0.08	16,860	0.07
April	795	--	933	0.85	4,124	0.19	5,982	0.13	9,456	0.08	10,528	0.08
May	369	--	432	0.85	2,196	0.17	2,753	0.13	4,147	0.09	4,637	0.08
June	132	--	152	0.87	667	0.2	875	0.15	1,436	0.09	1,604	0.08
July	38	--	43	0.88	141	0.27	207	0.18	382	0.1	423	0.09
August	17	--	19	0.89	47	0.36	78	0.22	157	0.11	174	0.1
September	19	--	20	0.95	43	0.44	81	0.23	146	0.13	163	0.12

The duration of the high concentrations would be extended by the time it takes to drain the reservoir and would depend upon the particular streamflow at the time. It is estimated that there would be approximately 10,000 ac-ft of storage remaining behind the dam, and the outlet capacity of the tunnel used for drawdown is 7,000 cfs. The plug of the tunnel is intended to be detonated during or preceding an anticipated flood event. The 2-year flood in the Eel River at this location has a peak discharge of over 11,000 cfs, and therefore, it is possible that it would take some time to drain the reservoir and there could be a delayed flush of fine sediment after the initial tunnel opening.

A TPCM for fine sediment erosion was not developed to analyze the effect of removing Cape Horn Dam or adjacent cofferdams. Other dam removal projects, such as the removal of J.C. Boyle Dam on the Klamath River in Oregon (a similarly sized dam with a sediment load of 1.3–2.9 million $yd.^3$ of fine sediment) can provide some insight into possible effects to suspended sediment concentrations below Cape Horn Dam. Spikes in suspended sediment in the Klamath River were observed following two stoplog blasts during the drawdown of J.C. Boyle Reservoir with a maximum concentration of 4,280 mg/L measured at the nearest U.S. Geological Survey (USGS) station located 6.5 miles [mi.] downstream (USGS 11510700). Moderately high suspended sediment concentrations (over 500 mg/L) lasted about a month following the initial drawdown of J.C. Boyle Reservoir, and suspended sediment concentrations continued to spike above 500 mg/L for about three months. It is, therefore, likely that the removal of cofferdams at Cape Horn Dam would result in elevated suspended sediment concentrations in the Eel River for several days and up to several weeks. However, the suspended sediment concentrations are likely to be lower than those observed below J.C. Boyle due to the difference in the composition of sediments from the two reservoirs. A size distribution analysis of the sediments from Van Arsdale Reservoir showed that silt and clay (less than 0.0626 millimeters [mm]) made up less than 1 percent of the total sediment sample (Geosyntec 2020). A similar analysis of sediments from J.C. Boyle Reservoir indicated that over 90 percent was composed of silt and clay of less than 0.0626 mm (USGS 2022). This indicates that significantly less fine sediment would be released from the removal of Cape Horn Dam than was mobilized by the removal of J.C. Boyle Dam.

PG&E would schedule the adit blast at Scott Dam and the removal of the Cape Horn cofferdams during a period of high flows, which would minimize the duration of elevated suspended sediment to the extent possible. A very large flush of sediments would travel down the Eel River from Scott Dam and cause high turbidity along the entire Eel River to the ocean. A much smaller contribution to suspended sediments would be made by the Cape Horn Dam deconstruction approximately 11.7 mi. downstream of Scott Dam. As the highly turbid water travels down the Eel River to the mouth of the Eel River estuary, suspended sediments would be diluted from tributary inflows and some suspended sediment would settle out along the way in the riverbed. These sediments would be remobilized with subsequent high-flow events, possibly over the course of several years, until they make their way out of the system.

Removing Scott Dam and Cape Horn Dam would have a short-term unavoidable adverse effect on suspended sediments and turbidity in the Eel River for a period of several days up to several months, for which no mitigation is possible. This effect is likely to extend along the entire length of the Eel River, including the estuary and nearshore. This action would also have a smaller long-term effect of increased turbidity during high-flow events as the remainder of the sediments are remobilized and carried out to the ocean for 1 to 3 years. PG&E would implement the Post-construction Water Quality and Water Temperature Monitoring Plan. This plan would include monitoring of water quality, including turbidity, and define appropriate response actions. In addition, PG&E would implement the Estuary Protection Plan that would include measures to monitor turbidity in the estuary.

Release of Toxic Sediment

Removal of Scott Dam and Cape Horn Dam and the associated releases of trapped sediment from behind the dams have the potential to release inorganic and organic contaminants into the Eel River. In 2020, Geosyntec (2020) characterized sediments in Lake Pillsbury and Van Arsdale Reservoir to support the California State Coastal Conservancy's evaluation of current sediment quality conditions. The objective was to chemically analyze the soft reservoir sediments that have accumulated behind Scott and Cape Horn dams and that could potentially mobilize during dam removal. Analytical results were compared to published freshwater sediment screening levels and background concentrations. Overall, results indicated that the Lake Pillsbury and Van Arsdale Reservoir sediments were generally not contaminated and represent background conditions for remote reservoirs. Specific analytical findings were as follows:

- Many constituents were not detected, including polychlorinated biphenyls, organophosphate pesticides, herbicides, diesel-range organic total petroleum hydrocarbons (TPH), asbestos, many semi-volatile organic compounds (SVOCs), some metals (i.e., antimony, beryllium, cadmium, molybdenum, selenium, silver, thallium), and most organochlorine pesticides.
- The chemicals/metals detected included some metals, methylmercury, some SVOCs, motor-oil-range TPH, methoxychlor, and two dioxin congeners (Van Arsdale Reservoir only). Except for nickel, all other detected chemicals were below freshwater sediment screening levels. Nickel concentrations were elevated about two- to three-fold above the screening levels but are likely indicative of background concentrations in this area, as they fall within the range of concentrations measured in other reservoirs and California soils.

The results of the 2020 Geosyntec sediment study indicate that sediments held behind Scott Dam and Cape Horn Dam do not contain contaminants of concern, and therefore, there would be a negligible effect on downstream water quality in the Eel River from potential release of toxic sediments due to the removal of either dam.

Change in Other Water Quality Parameters

Removal of Scott Dam and Cape Horn Dam and the associated releases of trapped sediment from behind the dams have the potential to affect water quality parameters such as dissolved oxygen, nutrients, chlorophyll-a, algal toxins, pH, and alkalinity in the Eel River.

Dissolved Oxygen

High suspended sediment concentrations are likely to result in significant impacts to dissolved oxygen downstream while Lake Pillsbury is draining. The sediment is anoxic and contains chemical oxygen demand (COD) (oxygen required to oxidize inorganic chemicals) and biological oxygen demand (BOD) (oxygen consumed by living organisms, e.g., bacteria). When sediment is scoured and released from the reservoir, intense consumption of oxygen in the water due to COD and BOD would result in a period of low dissolved oxygen that could extend many miles downstream from Scott Dam. On the Klamath River in January of 2024 when sediment was released from Iron Gate and Copco No. 1 dams (USGS river mile 190.2 and 198.3, respectively), dissolved oxygen was 0.0 mg/L from Copco No. 1 Dam downstream to Walker Bridge (42 mi.; USGS river mile 156.3) for 1 to 2 days. Dissolved oxygen was depressed from a typical 11 mg/L down to 5 mg/L as far as 70 mi. downstream the Klamath River at Seiad Valley (USGS river mile 128.5). Based on these observations, it is reasonable to suggest that low dissolved oxygen conditions would exist below Scott Dam and result in a period of 1 to 2 days (or potentially longer depending on sediment loads) of 0.0 mg/L dissolved oxygen as far downstream as the Middle Fork Eel River (49.2 mi.). The exact extent and duration of this dissolved oxygen sag would depend on the COD and BOD loads released from the sediments, the water temperature, the rate of reaeration in the Eel River, and the flows.

The removal of the cofferdams upstream and downstream of Cape Horn Dam and the associated release of trapped sediments would likely result in a brief decrease in dissolved oxygen in the Eel River below Cape Horn Dam. The exact magnitude, extent, and duration of the effects are unknown but can be informed by the removal of J.C. Boyle Dam on the Klamath River in Oregon. The USGS gage located 6 mi. downstream of J.C. Boyle observed two brief dissolved oxygen dips (corresponding to stoplog blasts used to release water from behind the dam) of 6.1 mg/L for 1 hour and 9 mg/L for 1.5 hours, with a baseline dissolved oxygen of 10.5–12 mg/L. Although the overall sediment load released from behind Cape Horn Dam would be similar, it would likely be that the effect to dissolved oxygen would be less due to the difference in sediment composition between the two reservoirs. A size distribution analysis of the sediments from Van Arsdale Reservoir showed that silt and clay (less than 0.0626 mm) made up less than 1 percent of the total sediment sample (Geosyntec 2020). A similar analysis of sediments from J.C. Boyle Reservoir indicated that over 90 percent was composed of silt and clay of less than 0.0626 mm (USGS 2022). It is, therefore, likely that the impact to dissolved oxygen from the release of sediments behind the cofferdams would be moderate and may not pose a lethal effect on fish or other aquatic organisms downstream.

PG&E would schedule the adit blast at Scott Dam and removal of the Cape Horn cofferdams during a time of high flows and low water temperatures, which would minimize the potential effects to dissolved oxygen to the extent possible. Regardless, removing Scott Dam would have an unavoidable adverse effect on dissolved oxygen in the Eel River for a period of several days and as far as 40–50+ mi. downstream, for which no mitigation is possible. The effect on dissolved oxygen of removing the Cape Horn cofferdams would be moderate, and as it would happen in the same season as the removal of Scott Dam, it would likely be masked by the larger effect from upstream once the flows reach the Cape Horn Dam Area a few hours following the adit blast. PG&E would implement the Post-construction Water Quality and Water Temperature Monitoring Plan. This plan would identify monitoring of water quality, including dissolved oxygen. In addition, PG&E would implement the Estuary Protection Plan that would include measures to monitor water quality in the estuary.

Nutrients, Algae Production, and Algal Toxins

Sediment releases have the potential to release nutrients into the Eel River that could fuel the excessive growth of algae and aquatic plants. Toxic algal blooms due to excessive growth of certain cyanobacteria have been observed in the Eel River Watershed in several recent years (see Section 3.3.2, Water Quality). The sediment study carried out in 2020 (Geosyntec 2020) measured average concentrations of total Kjeldahl nitrogen and total phosphorous in Lake Pillsbury sediments of 2,415 milligrams per kilogram (mg/kg) and 376 mg/kg, respectively. These concentrations represent relatively high levels of nutrients (Marx et al. 1999) that are typical of a eutrophic system. The same study (Geosyntec 2020) measured average concentrations of total Kjeldahl nitrogen and total phosphorous in Van Arsdale Reservoir sediments of 369 mg/kg and 143 mg/kg, respectively. These concentrations represent moderately high levels of nutrients in sediments (Marx et al. 1999) but are significantly lower than concentrations found in Lake Pillsbury.

PG&E would schedule the removal of Scott Dam during a time of high flows and low water temperature, which would minimize the potential short-term effects of increased nutrient loads in the Eel River to the extent possible. Algal blooms caused by high nutrient loads generally require warm, slow-moving water and, therefore, would be unlikely to occur during high winter flow periods. Much of the sediment and nutrients present in the sediments would be flushed out to the ocean before immediate effects would be expected (following summer). However, it is possible that some sediment settling would occur along the length of the Eel River, and these nutrient-rich sediments have the potential for causing increased algal production in the first and subsequent summers when algae growth conditions are more favorable. It is expected, therefore, that removal of Scott Dam would have a short-term (1 to 3 years) significant effect on water quality in the Eel River due to high nutrient levels, which could lead to algal blooms, some of which could produce toxins. PG&E would implement the Post-construction Water Quality and Water Temperature Monitoring Plan. This plan would include monitoring of water quality. In addition, PG&E would implement the Estuary Protection Plan that would include measures to monitor water quality in the estuary.

pH and Alkalinity

Potential fluctuation of other water quality parameters such as pH and alkalinity is possible as a result of the deconstruction of Scott and Cape Horn dams. Data from the removal of Copco No. 1 Dam as part of the Klamath River Dam removal project indicate that effects to pH were relatively moderate and of short duration. pH measured downstream of Copco No. 1 Dam dropped from 7.5 to a minimum of 6.4 after dam removal and took two weeks to fully recover (USGS 2024a). Data from the removal of J.C. Boyle Dam as part of the Klamath River Dam removal project also indicate that effects to pH were relatively minor and of short duration. pH was measured 6 mi. downstream of J.C. Boyle, and it dropped from 8 to a minimum of 7.1 and remained below 7.7 for about one day (USGS 2024b). Alkalinity would also be expected to drop due to the release of large amounts of sediment from the reservoir, which can temporarily bind with available alkaline particles in the water. These effects are not expected to be of long duration.

The removal of Scott Dam and Cape Horn Dam is expected to have a short-term (less than a month) significant effect on pH and reduction in alkalinity in the Eel River. PG&E would implement the Post-construction Water Quality and Water Temperature Monitoring Plan. This plan would include monitoring of water quality.

Water Temperature

Following removal of Scott and Cape Horn dams, the Eel River would return to unimpaired flow conditions, which would affect existing water temperature by increasing water temperature in the summer and decreasing water temperature in the winter. Water temperature in the Eel River at the E2 gage (downstream of the current location of Scott Dam) could increase (up to 8.5°C) from approximately May through the end of August compared to existing conditions (No-Action Alternative) (based on recent data from 2020–2023). Water temperatures at this location from September through January would be cooler (up to 5°C) when compared to existing conditions. The anticipated distance of the water temperature effects is from Scott Dam to below Cape Horn

Dam some distance (a few miles). Farther downstream after diversion flows are removed from the Eel River at the Van Arsdale Diversion, water temperatures return to unimpaired conditions.

The Proposed Action decrease in water temperature in the winter below Cape Horn Dam may not be harmful compared to the No-Action Alternative, but the increase in spring and summer water temperature would have a short-term and long-term unavoidable adverse negative effect on existing cold-water conditions in the Eel River from below Scott Dam to below Cape Horn Dam (a few miles). PG&E would implement the Post-construction Water Quality and Water Temperature Monitoring Plan. This plan may include monitoring of water temperature in the Eel River if necessary. In addition, PG&E would implement the Estuary Protection Plan that would include measures to monitor water temperature in the estuary. While the resulting condition and restoration of the Eel River to unimpaired conditions would have an unavoidable adverse effect on water temperature, the change to natural conditions, overall, is considered to be a beneficial effect on the Eel River.

The change in water temperature would also affect water temperature in the East Branch Russian River through reduction of flows into the East Branch Russian River (see East Branch Russian River section below).

Contamination from Herbicides

Herbicides may be used to treat invasive weeds under the Restoration Plan in the newly exposed reservoir beds in Lake Pillsbury and Van Arsdale Reservoir. The Restoration Plan would also include a water quality monitoring plan and BMPs to be implemented in the event that herbicides are used to treat invasive weeds. With the implementation of these measures, there would be no effect to water quality in the Eel River from herbicide contamination.

Beneficial Uses

The removal of Scott Dam has the potential to affect beneficial uses of Lake Pillsbury and the Eel River. The Basin Plan water quality standards are composed of designated existing (E) and potential (P) beneficial uses and water quality objectives. According to the Basin Plan, existing beneficial uses for the Project Area include the following (NCRWQCB 2018):

- Municipal and domestic supply (MUN)
- Agricultural supply (AGR)
- Industrial service supply (IND)
- Groundwater recharge (GWR)
- Freshwater replenishment (FRSH)
- Navigation (NAV)
- Power generation (POW)
- Contact recreation (REC-1)
- Non-contact recreation (REC-2)
- Commercial and sport fishing (COMM)
- Warm freshwater habitat (WARM)
- Cold freshwater habitat (COLD)
- Wildlife habitat (WILD)
- Rare, threatened, or endangered species (RARE)
- Migration of aquatic organisms (MIG)
- Cold spawning habitat (SPWN)
- Aquaculture (AQUA)

Beneficial uses that have the potential to be affected by the removal of Scott Dam and Cape Horn Dam include agricultural supply (ARG); groundwater recharge (GWR); power generation (POW); contact recreation (REC-1); non-contact recreation (REC-2); commercial and sport fishing (COMM); warm freshwater habitat (WARM); cold freshwater habitat (COLD); wildlife habitat (WILD); rare, threatened, or endangered species (RARE); migration of aquatic organisms (MIG); cold spawning habitat (SPWN); and aquaculture (AQUA).

Following the blasting of the adit at Scott Dam and removal of the Cape Horn cofferdams, most of the beneficial uses listed above would be or could be affected. Water quality discussed in this section above addresses conditions potentially related to contact recreation (REC-1) and fish and wildlife habitat (COMM, WARM, COLD, WILD, RARE, MIG, SPWN, and AQUA). These water quality parameters are used in Section 3.4.1.10, Recreation Resources; Section 3.4.1.4, Fish and Aquatic Resources; and Section 3.4.1.6, Wildlife Resources, to address their respective beneficial uses. Other issues related to changes in water supply (POW, GWR) are addressed in Section 3.4.1.2, Water Use and Hydrology, and Section 3.4.1.7, Geology and Soils, respectively.

East Branch Russian River

After the adit blast at Scott Dam and removal of the Cape Horn Dam cofferdams, the Eel River would experience high turbidity and low dissolved oxygen conditions for several days up to several weeks; however, under the Proposed Action, there would not be facilities to divert water to the East Branch Russian River (see Section 3.4.2, Cumulative Effects Analysis, for a discussion of the effects of the New Eel-Russian Facility [NERF]); therefore, water quality in the East Branch Russian River would not be affected, except a reduction of flows into the East Branch Russian River would affect water temperature. Reduced flows during the summer in the East Branch Russian River would increase water temperature in the East Branch Russian River compared to the No-Action Alternative. This change in water temperature would be similar to unimpaired conditions. There would be a short-term and long-term unavoidable adverse effect on water temperature during the spring and summer months compared to the No-Action Alternative.

Phase 2b: Resulting Conditions and Restoration

Resulting physical conditions and restoration (Phase 2b) potential effects to water quality resulting from physical changes that may occur following removal of the dams and recreation facilities/ancillary facilities compared to the No-Action Alternative (existing condition) were evaluated:

- Increase in turbidity and suspended sediments during high-flow events;
- Modified water temperature/return to unimpaired water temperature conditions; and
- Beneficial uses.

Mainstem Eel River

Following draining of Lake Pillsbury and Van Arsdale Reservoir, restoration of the former reservoir beds would be in process. The restoration goals are listed in Section 2.0, Table 2-11. Final removal of the dam and recreational facilities would have already occurred, and hydrology in the Eel River would be restored to unimpaired conditions.

Increase in Turbidity and Suspended Sediments

Increased turbidity in the Eel River downstream of Scott and Cape Horn dams is expected during high-flow events for up to several years following their removal. Accumulated sediments that are not immediately mobilized during reservoir drawdown would continue to erode over time, releasing higher concentrations of suspended sediments into the Eel River than would be present under existing conditions. However, in the long term, suspended sediment concentrations would eventually return to unimpaired levels following several years of high-flow events.

The resulting conditions and restoration of Project lands as a result of the Proposed Action would have a beneficial effect on turbidity and suspended sediments in the Eel River. Turbidity and suspended sediment conditions would return to natural conditions.

Modified Water Temperature

Following removal of Scott and Cape Horn dams, the Eel River would return to unimpaired flow conditions, which would affect existing water temperature by increasing water temperature in the summer and decreasing water temperature in the winter. Water temperature in the Eel River at the E2 gage (downstream of the current location of Scott Dam) could increase (up to 8.5°C) from approximately May through the end of August compared to existing conditions under the No-Action Alternative (based on recent data from 2020–2023). Water temperatures at this location from September through January would be cooler (up to 5°C) when compared to existing conditions. The anticipated distance of the water temperature effects is from Scott Dam to below Cape Horn Dam some distance (few miles). Farther downstream after diversion flows are removed from the Eel River at the Van Arsdale Diversion, water temperatures return to unimpaired conditions.

The Proposed Action decrease in water temperature in the winter below Cape Horn Dam may not be harmful compared to the No-Action Alternative, but the increase in spring and summer water temperature would have a long-term unavoidable adverse effect on existing cold-water conditions in the Eel River from below Scott Dam to below Cape Horn Dam a few miles. While the resulting conditions and restoration of Eel River to unimpaired conditions would have an unavoidable adverse effect on water temperature, the change to natural conditions, overall, is considered to be a beneficial effect on the Eel River.

The change in water temperature would also affect water temperature in the East Branch Russian River through reduction of flows into the East Branch Russian River (see East Branch Russian River section below).

Beneficial Uses

The removal of Scott Dam has the potential to affect beneficial uses of Lake Pillsbury and the Eel River.

The Basin Plan water quality standards are composed of designated E and P beneficial uses and water quality objectives. According to the Basin Plan, existing beneficial uses for the Project Area include the following (NCRWQCB 2018):

- Municipal and domestic supply (MUN)
- Agricultural supply (AGR)
- Industrial service supply (IND)
- Groundwater recharge (GWR)
- Freshwater replenishment (FRSH)
- Navigation (NAV)
- Power generation (POW)
- Contact recreation (REC-1)
- Non-contact recreation (REC-2)
- Commercial and sport fishing (COMM)
- Warm freshwater habitat (WARM)
- Cold freshwater habitat (COLD)
- Wildlife habitat (WILD)
- Rare, threatened, or endangered species (RARE)
- Migration of aquatic organisms (MIG)
- Cold spawning habitat (SPWN)
- Aquaculture (AQUA)

Water quality discussed in this section addresses conditions potentially related to contact recreation (REC-1) and fish and wildlife habitat (COMM, WARM, COLD, WILD, RARE, MIG, SPWN, and AQUA). These water quality parameters are used in Section 3.4.1.10, Recreation Resources; Section 3.4.1.4, Fish and Aquatic Resources; and Section 3.4.1.6, Wildlife Resources, to address their respective beneficial uses. Other issues related to changes in water supply (POW, GWR) are addressed in Section 3.4.1.2, Water Use and Hydrology, and Section 3.4.1.7, Geology and Soils, respectively.

East Branch Russian River

After removal of Scott Dam and Cape Horn Dam under the Proposed Action, there would not be storage or facilities to divert water to the East Branch Russian River (see Section 3.4.2, Cumulative Effects Analysis, for a discussion of the effects of the NERF); therefore, water quality in the East Branch Russian River would not be affected, except a reduction of flows into the East Branch Russian River would affect water temperature. Reduced flows during the summer in the East Branch Russian River would increase water temperature compared to the No-Action Alternative. This change in water temperature would be a return to unimpaired conditions. There would be a long-term unavoidable adverse effect on water temperature during the spring and summer months compared to the No-Action Alternative.

Dam Removal Sequencing Options

Two alternate sequencing options to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: Option 1, if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam, and Option 2, if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

This is in contrast to the Proposed Action whereby PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season and remove the adit plug at Cape Horn Dam and the Cape Horn Dam cofferdams simultaneously or in close sequence to flush sediment from the reservoirs.

Alternate Sequencing Option 1

<u>Phase 1: Construction Effects</u>

The Phase 1 construction-related effects to water quality of alternate sequencing option 1 (removing Scott Dam prior to Cape Horn Dam removal) would be the same as for the Proposed Action. The same construction and environmental measures would be implemented under the Proposed Action and alternate sequencing option 1. With implementation of these measures, the effects to water quality (turbidity / suspended sediment, pollutant spill risk, contamination from stormwater runoff / human waste) would be negligible in the Eel River and East Branch Russian River.

<u>Phase 2a: Initial Conditions and Preliminary Restoration</u>

Under alternate sequencing option 1, the Scott Dam adit would be removed and sediment from Lake Pillsbury would be flushed down the Eel River prior to the removal of Cape Horn Dam. Under this scenario, it is expected that the effects to water quality in the Eel River related to turbidity / suspended sediment, dissolved oxygen, water temperature, and other parameters from the removal of Scott Dam would be similar to the effects under the Proposed Action. In the reach of the Eel River between Scott Dam and Cape Horn Dam, the effects would be the same as under the Proposed Action. In the Eel River downstream of Cape Horn Dam, the delayed removal of Cape Horn Dam would marginally reduce the effects of removing the two dams simultaneously in the first year. A marginal reduction would occur in the first year (when Scott Dam is removed) because some sediment (sand, suspended sediment) from Lake Pillsbury would be deposited behind Cape Horn Dam. As a result, suspended sediment concentrations downstream of Cape Horn Dam due to the removal of Scott Dam may be slightly reduced (Phase 2a effects) due to deposition of sediment at Van Arsdale Reservoir. Despite this marginal reduction, high turbidity is expected to be observed below Van Arsdale Reservoir that would extend to the Eel River estuary and nearshore ocean. A period of zero dissolved oxygen would also be expected to extend downstream of Van Arsdale Reservoir, possibly for another 30–40 mi., that would last for 1–2+ days.

In a subsequent year, when Cape Horn Dam is removed, another flush of high turbidity / suspended sediment would be released into the Eel River. This would be a much smaller release of turbidity / suspended sediments than would have been mobilized from behind Scott Dam (see Increase in Turbidity and Suspended Sediment section above for a discussion of the relative effects of removing Scott Dam and Cape Horn Dam). Removal of the Cape Horn cofferdams would result in a release of high turbidity / suspended sediment that would continue from a few days up to a few weeks. A dissolved oxygen sag is expected to occur downstream of Cape Horn Dam (approximately 5–10+ mi. downstream) that would last for a few hours to a day. The effects on turbidity and dissolved oxygen would be small compared to those observed during the removal of Scott Dam in a prior year.

Alternate sequencing option 1 would result in an extended period of elevated turbidity in the Eel River as a result of the staggered timing of the Scott Dam and Cape Horn Dam removals. It is expected that during the first few years following release of sediment from Scott Dam and then to a lesser extent following the release from Cape Horn Dam that turbidity in the Eel River would be elevated as the reservoir beds are restored and sediments that settled out after the initial release are remobilized during subsequent high-flow events.

Water quality in the East Branch Russian River under alternate sequencing option 1 would be similar to that under the Proposed Action, except delayed deconstruction of Cape Horn Dam / construction of the NERF would affect the timing of potential elevated turbidity and reduced flows into the East Branch Russian River.

Overall, option 1 would have unavoidable adverse effects on water quality (turbidity / suspended sediment concentrations, low dissolved oxygen concentrations, and water temperature) in the Eel River similar to those under the Proposed Action but the effects would be split between 2 years, with one large adverse effect occurring in year 1 when Scott Dam is removed (very high turbidity / suspended sediment release, severe dissolved oxygen sag for many miles downstream) and a much smaller effect in a subsequent year when Cape Horn Dam and the associated cofferdams are removed (high turbidity / suspended sediment release, downstream dissolved oxygen sag).

Phase 2b: Resulting Conditions and Restoration

The Phase 2b–related effects to water quality of option 1 (removing Scott Dam prior to Cape Horn Dam removal) would be the same as for the Proposed Action but with delayed timing. Alternate sequencing option 1 would restore flow and water quality (turbidity / suspended sediment, water temperature) to approximately natural conditions in years 3–4 of the Project as compared to natural conditions being restored at the end of years 1–2 for the Proposed Action. With removal of the dams and recreation facilities, the effects to water quality would be beneficial in the Eel River and East Branch Russian River, except there would be an unavoidable adverse effect to summer water temperature in the Eel River (Scott Dam to below Cape Horn Dam) and East Branch Russian River compared to the No-Action Alternative.

Alternate Sequencing Option 2

Phase 1: Short-term Construction Effects

The Phase 1 construction-related water quality effects of alternate sequencing option 2 (removing Cape Horn Dam prior to Scott Dam removal) would be the same as for the Proposed Action. The same construction and environmental measures would be implemented under the Proposed Action and alternate sequencing option 2. With implementation of these measures, the effects to water quality (turbidity / suspended sediment, pollutant spill risk, contamination from stormwater runoff / human waste) would be negligible in the Eel River and East Branch Russian River.

Phase 2a: Initial Conditions and Preliminary Restoration

Under alternate sequencing option 2 in which Cape Horn Dam is removed (including the cofferdams) prior to the removal of Scott Dam, the overall effect on water quality would be similar to that under the Proposed Action but would be split between 2 years. Cape Horn Dam deconstruction would result in a release of turbidity / suspended sediment into the Eel River. This would be a much smaller release of turbidity / suspended sediment than would have been mobilized from behind Scott Dam (see Increase in Turbidity and Suspended Sediment section above for a discussion of the relative effects of removing Scott Dam and Cape Horn Dam). Removal of the cofferdams would result in high turbidity / suspended sediment that would continue for a few days up to a few weeks. A dissolved oxygen sag is expected to occur downstream of Cape Horn Dam (extending approximately 5–10+ mi. downstream) that would last for a few hours to a day. The effects on turbidity and dissolved oxygen would be small compared to those observed during the removal of Scott Dam.

When the Scott Dam adit is opened in a subsequent year, it is expected that the adverse effects to water quality in the Eel River due to turbidity / suspended sediment, dissolved oxygen, water temperature, and other parameters from Scott Dam removal would be similar to the effects under the Proposed Action. In the reach of the Eel River between Scott Dam and Cape Horn Dam, the effects would be the same as under the Proposed Action. In the Eel River downstream of Cape Horn Dam, the previous removal of Cape Horn Dam would marginally reduce the effects of removing the two dams simultaneously. Despite this marginal reduction compared to the Proposed Action, high turbidity is expected to be observed below Van Arsdale Reservoir that would extend to the Eel River estuary and nearshore. A period of zero dissolved oxygen would also be expected to extend downstream of Van Arsdale Reservoir, possibly for another 30–40 mi., that would last 2+ days.

Alternate sequencing option 2 would result in an extended period of elevated turbidity in the Eel River because of the staggered timing of the Scott Dam and Cape Horn Dam removals. It is expected that during the first few years following release of sediment from Cape Horn Dam and then to a greater extent following the release from Scott Dam that turbidity in the Eel River would be elevated as the reservoir beds are restored and sediments that settled out after the initial release are remobilized during subsequent high-flow events.

Water quality in the East Branch Russian River under alternate sequencing option 2 would be similar to that under the Proposed Action, except deconstruction of Cape Horn Dam / construction of the NERF would occur prior to the removal of Scott Dam, which would affect the timing of potential elevated turbidity and reduced flows into the East Branch Russian River.

Overall, alternate sequencing option 2 would have unavoidable adverse effects on water quality (turbidity / suspended sediment concentrations, low dissolved oxygen concentrations, water temperature) in the Eel River similar to those under the Proposed Action but the effects would be split between 2 years, with one smaller adverse effect occurring in year 1 when Cape Horn Dam and the associated cofferdams are removed and a much larger effect in a subsequent year when Scott Dam is removed (high turbidity / suspended sediment release, downstream dissolved oxygen sag).

Phase 2b: Resulting Conditions and Restoration

The Phase 2b–related effects to water quality of alternate sequencing option 2 (removing Cape Horn Dam prior to Scott Dam removal) would be similar to those under the Proposed Action but with delayed timing. Alternate sequencing option 2 would restore flow and water quality (turbidity / suspended sediment, water temperature) to approximately natural conditions in years 3–4 of the Project as compared to natural conditions being restored at the end of years 1–2 for the Proposed Action. With removal of the dams and recreation facilities, the effects to water quality would be beneficial in the Eel River and East Branch Russian River, except there would be an unavoidable adverse effect to summer water temperature in the Eel River (Scott Dam to below Cape Horn Dam) and East Branch Russian River compared to the No-Action Alternative.

Construction and Environmental Measures

To avoid or reduce effects to water temperature and quality during construction, PG&E would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Construction Site Water Diversion, Dewatering, and Drawdown Plan
- Construction Water Quality and Water Temperature Monitoring Plan
- Construction Best Management Practices (BMPs)
- East Branch Russian River Diversion Plan
- Stormwater Pollution Prevention Plan (SWPPP)
- Construction Erosion Prevention Plan
- Hazardous Materials Handling Measures:
  - Spill Prevention, Control, and Countermeasures Plan (SPCC)
  - Construction-related BMPs
  - Required compliance with applicable local, state, and federal standards associated with handling and disposal of hazardous materials.

Construction also would include obtaining and implementing resource agency and construction permits; following water quality BMPs (e.g., Forest Service 2012); and complying with local, state, and federal laws (e.g., Basin Plan water quality requirements):

- U.S. Army Corps of Engineers Section 404 Clean Water Act Permit
- State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification
- State Water Resources Control Board Construction General Permit/SWPPP

To reduce potential effects to water quality and temperature post-facility removal (Phase 2), PG&E would implement the following environmental measures. A complete list of environmental measures is included in Section 2.2.3.

- Post-construction Water Quality and Water Temperature Monitoring Plan
- Restoration Plan

Unavoidable Adverse Effects

Phase 1: Short-term Construction

There would be a short-term unavoidable adverse effect to suspended sediment and turbidity in Lake Pillsbury and the Eel River downstream of Scott Dam as a result of reservoir dewatering, dam lowering, and dredging during Scott Dam deconstruction under the Proposed Action.

Phase 2a: Initial Conditions and Preliminary Restoration

Unavoidable adverse effects to water quality and water temperature include the following:

- Short-term unavoidable adverse effect on suspended sediment and turbidity in the Eel River from removal of the dams for a period of several days up to several months, for which no mitigation is possible:
  - This effect is likely to extend along the entire length of the Eel River, including the estuary and nearshore ocean environment.
  - This action would also have a smaller long-term effect of increased turbidity during high-flow events as the remainder of the sediments are remobilized and carried out to the ocean for 1 to 3 years.
- Short-term unavoidable adverse effect on dissolved oxygen in the Eel River from Scott Dam removal for a period of several days and as far as 40–50+ mi. downstream from Scott Dam, for which no mitigation is possible:
  - The impact on dissolved oxygen of removing the Cape Horn cofferdams would be moderate, and as it would happen in the same season with the removal of Scott Dam, it would likely be masked by the larger impact from upstream once the flows reach the Cape Horn Dam Area a few hours following the adit blast.
- Short-term (1 to 3 years) unavoidable adverse effect on water quality in the Eel River from the removal of Scott Dam due to high nutrient levels, which could be accompanied by higher chlorophyll-a and algal toxins due to algal blooms.

Phase 2b: Resulting Conditions and Restoration

Unavoidable adverse effects to water quality and water temperature include the following:

- Increased spring and summer water temperature would have a long-term unavoidable adverse negative effect on existing cold-water conditions in the Eel River from below Scott Dam to below Cape Horn Dam a few miles compared to the No-Action Alternative:
  - While the resulting condition and restoration of Eel River to unimpaired conditions would have an unavoidable adverse effect on water temperature, the change to natural conditions, overall, is considered to be a positive effect on the Eel River.
- Increased spring and summer water temperatures in the East Branch Russian River because diversions to the East Branch Russian River would no longer occur would have a long-term unavoidable adverse negative effect on existing water temperature conditions compared to the No-Action Alternative:
  - This change in water temperature would be similar to unimpaired conditions.

References

Forest Service (U.S. Forest Service). 2012. National Best Management Practices for Water Quality Management on National Forest System Lands. Available at: FS_National_Core_BMPs_April2012_sb.pdf (usda.gov).

Geosyntec (Geosyntec Consultants, Inc. 2020. Memorandum: Lake Pillsbury and Van Arsdale Reservoir Sediment Characterization. Prepared for California State Coastal Conservancy. April.

Marx, E.S., J. Hart, and R.G. Stevens. 1999. Soil test interpretation guide: Oregon State University Extension Service, EC 1478, Corvallis, Oregon, 8 pp.

NCRWQCB (North Coast Regional Water Quality Control Board). 2018. Water quality control plan for the North Coast region. May. Available at: Basin Plan Documents | California North Coast Regional Water Quality Control Board.

Stillwater Sciences. 2021a. Analyses of Fine Sediment Erosion Following the Proposed Scott Dam Removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

Stillwater Sciences. 2021b. Analyses of Fine Sediment Erosion Effects on Aquatic Species Following the Proposed Scott Dam Removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

USGS (U.S. Geological Survey). 2024a. Water Data for the Nation – Klamath R AB Fall C NR Copco CA – 11511990. USGS. Available at: https://waterdata.usgs.gov/monitoring-location/11511990.

USGS (U.S. Geological Survey). 2024b. Water Data for the Nation – Klamath River Below John C. Boyle Powerplant, NR Keno, Or – 11510700. USGS. Available at: https://waterdata.usgs.gov/monitoring-location/11510700.

USGS (U.S. Geological Survey). 2022. Science Data Catalog – Bed material grain size distributions for surficial samples from Iron Gate, Copco, and J.C. Boyle Reservoirs. USGS. Retrieved from https://data.usgs.gov/datacatalog/data/USGS:6165af92d34eb58ff6a152a9.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Acronyms

°C	degrees Celsius
ac-ft	acre-feet
BMP	best management practice
cfs	cubic feet per second
DO	dissolved oxygen
DPS	Distinct Population Segment
EFH	essential fish habitat
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
ft.	foot/feet
FYLF	foothill yellow-legged frog
mg/L	milligrams per liter
NERF	New Eel-Russian Facility
NMFS	National Marine Fisheries Service
PG&E	Pacific Gas and Electric
Project	Potter Valley Hydroelectric Project
RM	river mile
RPA	Reasonable and Prudent Alternative
SEV	dose-response severity of ill effects
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
$yd.^3$	cubic yards

3.4.1.4 Fish and Aquatic Resources

This section describes the potential effects to fish and aquatic resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Phase 1 includes all construction activities associated with both dam removals, which are slated to occur during two low-flow seasons at Scott Dam, and the construction of cofferdams and the diversion channel at Cape Horn Dam. Phase 2 effects are further delineated into initial conditions and preliminary restoration (Phase 2a) and resulting conditions and restoration (Phase 2b). The effects are determined by analyzing the changes in fish and aquatic resources that may result from activities to be implemented under the Proposed Action (Section 2.2) compared to the No-Action Alternative (existing condition) (Section 2.1).

It is anticipated that removal of Scott Dam would require two low-flow and one intervening high-flow seasons to complete. It is anticipated that removal of Cape Horn Dam would require one low-flow season to complete. The low-flow construction seasons would extend from approximately June 1 to October 31 depending on weather conditions. Construction activities would likely be sequenced such that construction would occur at both sites at the same time; however, construction is analyzed in a general way in the event the activities are not linked temporally. Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal construction activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). Most removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Removal and restoration of Project recreational facilities would occur during the same seasons as dam removal (e.g., campgrounds, day-use facilities, recreation access roads and trails, kiosk, and boat ramps) located on U.S. Forest Service and PG&E lands.

Final effects determinations consider construction measures and post-facility removal measures included to avoid or mitigate the effects of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Species and Habitat

The Proposed Action may directly or indirectly affect individual fish and aquatic organisms or their habitats. It is anticipated that the direct and indirect adverse effects of the Proposed Action would generally be short-term and that the dam removals and river restoration would benefit fish and aquatic resources in the Eel River in the long term, including special-status aquatic species and their habitats.

The direct effects include the loss of or disturbance to special-status and other aquatic species known to occur in the Project Area and their habitats, including Endangered Species Act (ESA) federally threatened California Coastal Chinook salmon (*Oncorhynchus tshawytscha*), winter and summer run Northern California steelhead (*O. mykiss*), and Southern Oregon/Northern California coho salmon (*O. kisutch*); federally endangered tidewater goby (*Eucyclogobius newberryi*); ESA candidate threatened and Species of Special Concern (SSC) in California; northwestern pond turtle (*Actinemys marmorata*); and SSC, including foothill yellow-legged frog (FYLF) (*Rana boylii*), Pacific lamprey (*Entosphenus tridentatus*), western brook lamprey (*Lampetra richardsoni*), western river lamprey (*Lampetra ayresii*), western pearlshell mussel (*Margaritifera falcata*), green sturgeon (*Acipenser medirostris*), white sturgeon (*Acipenser transmontanus*), tidewater goby (*Eucyclogobius newberryi*), and coastal cutthroat trout (*Oncorhynchus clarkii clarkii*). Benthic macroinvertebrates and other native freshwater fish species, such as Sacramento sucker (*Catostomus occidentalis*), sculpin (*Cottus* spp.), and stickleback species (*Gasterosteus* spp.) would also be affected by the Proposed Action.

Indirect effects include modification of habitat that fish and aquatic species rely upon for migration, holding, spawning/reproduction, incubation, rearing, and recruitment. Indirect effects include modification of critical habitat for the federally listed species (Northern California Distinct Population Segment [DPS] steelhead, California Coastal Chinook salmon, tidewater goby), Magnuson-Stevens Fishery Conservation and Management essential fish habitat (EFH) (see Section 3.3.3, Table 3.3.3.-22), and habitat for other aquatic species (e.g., FYLF, northwestern pond turtle, lamprey, freshwater mussels).

Area of Analysis

The area of analysis includes Lake Pillsbury, Van Arsdale Reservoir, the Eel River from upstream of Lake Pillsbury downstream to the estuary, and the East Branch Russian River from the Potter Valley Powerhouse tailrace downstream to Lake Mendocino. The marine intertidal, tidal, and oceanic habitats between the mouth of the Eel River estuary and the open ocean are addressed in Section 3.4.1.19.

Phase 1: Short-term Construction Effects

The following potential effects to fish and aquatic resources as a result of Project facility modifications were evaluated:

Eel River, Lake Pillsbury, and Van Arsdale Reservoir:

- Modified fish attraction flows in the Eel River;
- Changes in water quality that may affect aquatic resources;
- Direct loss or disturbance of fish and aquatic species;
- Modification of aquatic habitats resulting from construction; and
- Release of non-native species from Lake Pillsbury or Van Arsdale Reservoir.

East Branch Russian River:

- Changes in water quality and effects to aquatic species; and
- Direct loss of aquatic species and habitat.

PG&E is proposing to develop a suite of construction plans and management measures to help mitigate the effects of the Proposed Action on fish and aquatic resources. These measures are included in the analysis sections below and summarized in the Construction and Environmental Measures section.

Analysis of the construction effects is based on the Conceptual Decommissioning Plan (Section 2.2.1.1) and discussed by spatial area (Scott Dam, Cape Horn Dam, East Branch Russian River) below.

Scott Dam Area

At Scott Dam, construction activities include the initiation of the reservoir drawdown after the runoff season when inflows would be generally below 400 cubic feet per second (cfs), which is the approximate capacity of the existing low-level outlet. The reservoir storage at the start of the drawdown period (June) would be approximately 50,000 acre-feet (ac-ft) at an elevation of 1,900 feet (ft.). Completion of the drawdown to approximately 10,000 ac-ft of storage at an elevation of 1,861.7 ft. would occur by October. To the extent possible, timing of the drawdown and flow releases would be coordinated with water demands in the East Branch Russian River. PG&E is proposing drawdown rates in Lake Pillsbury between approximately 1 and 2 ft. per day. Phase 1 also includes construction of temporary roads, a temporary barge launch and landing area, road improvements, construction of a 15-ft.-diameter adit tunnel at the base of Scott Dam, removal of sediment immediately upstream of the newly constructed adit tunnel, and construction of an artificial channel and buttress to facilitate downstream sediment transport. Some large, clean material from the dam (e.g., no rebar protruding, greater than approximately 2 ft. in diameter) would be placed in the plunge pool area below the dam. The material would be placed below the final river grade. Material will be large enough and placed deep enough so that it will not be eroded or mobilized.

During the initial low-flow season (June–October), the upper portion of Scott Dam would be removed. During the lowering of the dam, a large notch (10 to 15 ft. deep and 150 to 200 ft. wide; overall discharge capacity between 15,000 and 40,000 cfs depending on head) would be constructed in the spillway. This new, lower spillway would ensure that storage in Lake Pillsbury does not exceed the target storage of 10,000 ac-ft.

A temporary adit tunnel constructed in Scott Dam would be blasted opened during the first high-flow season (November to May) following the removal of the upper portion of the dam, which would result in significant sediment flushing. The sediment flushing from the removal of the adit plug is evaluated as part of Phase 2a: Post-facility Removal Effects and is separate from Phase 1: Short-term Construction Effects.

During the second low-flow season (following sediment flushing), dam removal would be completed. Dam removal would include cutting a section through the base of the dam to accommodate the bankfull flow and the 100-year flood. This final phase of construction would be completed while the Eel River is allowed to flow unimpaired past the remnants of Scott Dam. Construction activities during the second low-flow season would be primarily land-based (i.e., final dam removal activities), including removal of approximately 115,00 cubic yards ($yd.^3$) of material, most of which would be stored offsite. Additional mobilization of impounded sediment from behind Scott and Cape Horn dams may occur during the second low- and high-flow seasons, especially during precipitation or as unstable, exposed shorelines slump into the river channel.

Modified Fish Attraction Flows in the Eel River

During the initial low-flow season (June–October) drawdown of Lake Pillsbury, the ≤400-cfs release from Scott Dam could be higher than baseline conditions. Average monthly baseline flows from Scott Dam under existing conditions range from 170 to 200 cfs (see Table 3.3.1-7 in Section 3.3.1). These flows could affect migratory patterns for ESA listed Chinook salmon, coho salmon, and steelhead and may attract migrating salmonids past important spawning tributaries such as Tomki Creek and Outlet Creek prior to fall rainstorm events that water these streams. Fall-run Chinook salmon typically arrive in the upper Eel River in late October through late December. The run is typically over by the end of January. Winter-run steelhead start arriving at the fish ladder at Cape Horn Dam in mid-December, and the run typically peaks between January and March and ends by late May (see Figures 3.3.3-11 and 3.3.3-12 in Section 3.3.3). Some summer-run steelhead occur annually, but they are generally found in the lower watershed (i.e., Van Duzen River, Middle Fork Eel River). Coho salmon typically enter the Eel River in September, with peak migration occurring in November and December. The current distribution of coho salmon is primarily in the cooler coastal tributaries, particularly the South Fork Eel River, Van Duzen River, and lower Eel River. A small population persists in Outlook Creek and a few individuals may potentially be found in other tributaries to the upper Eel River; however, observations from the Project Area are sparse.

If the drawdown of Lake Pillsbury induced early migration of Chinook salmon into mainstem habitats prior to tributary habitats (Tomki Creek, Outlet Creek) having flows, this could move a large portion of adults into the Eel River reach above Cape Horn Dam to spawn in the same year that Scott Dam would be flushed of sediment. This could result in significant loss of that cohort of adults, spawning, and/or recruitment. Under existing conditions (No-Action Alternative), flow releases from Scott Dam, which are elevated compared to the unimpaired flow regime, can also attract migrating salmon into the upper Eel River past Tomki and Outlet creeks before fall rainstorms sufficiently wet those tributaries. However, under existing conditions, mainstem spawning may be successful compared to the Proposed Action, which would result in mortality of many mainstem spawners depending on the timing of the sediment release. Without a measure to manage drawdown releases, construction activities could have a significant, unavoidable adverse effect on salmon in the Eel River.

To minimize the potential adverse effects of changes in river flow on anadromous fish run timing (and other aquatic organisms) during construction, PG&E would implement a Construction Site Water Diversion, Dewatering, and Drawdown Plan that would be approved by resource agencies. The Construction Site Water Diversion, Dewatering, and Drawdown Plan would be intended to identify the appropriate dewatering flow timing and incorporate measures to (1) minimize unwanted attraction flow that would affect migratory fish entering the Eel River and (2) encourage migration of salmon into tributary streams (Tomki Creek, Outlet Creek) where adults and spawning will be protected from flushing of sediment from Lake Pillsbury. The plan may include diversion of flows at Cape Horn Dam to the East Branch Russian River (see East Branch Russian River Diversion Plan below). With implementation of the plan, Proposed Action construction activities would have a negligible effect on successful migration and spawning of salmon in the Eel River below Scott Dam.

Changes in Water Quality and Effects to Aquatic Species

Water temperature is a critical parameter for salmonids. Optimal water temperature for Chinook salmon varies by life stage, ranging from 5.6 degrees Celsius (°C) to 19°C (Richter and Kolmes 2005). The lethal limit for juvenile steelhead has been reported as 24°C (Richter and Kolmes 2005) although juvenile steelhead in the Eel River system are thought to withstand water temperature up to 26.5C (Kubicek 1977). Optimal water temperature for coho salmon ranges from 2.5°C to 20°C depending on life stage (Richter and Kolmes 2005). The lethal limit for juvenile coho has been reported as 22.0°C to 23°C (Richter and Kolmes 2005). Elevated water temperatures above these limits can adversely affect salmonid growth, migration, spawning, reproductive success, and recruitment (Richter and Kolmes 2005; FERC 2022).

Initial low-flow season construction activities at Scott Dam (June–October) would likely result in warm water temperatures downstream of Scott Dam that would at a minimum be similar to current dry-year conditions because stored water (including the coldwater pool) would be released from Lake Pillsbury approximately similar to how it is currently released in dry years. Based on 2023 summer water temperature monitoring profile data in Lake Pillsbury, hypolimnetic water released from the dam during the drawdown would likely range from approximately 10°C to 22°C or higher during the 5-month-long period (June–October). The Construction Site Water Diversion, Dewatering, and Drawdown Plan would include a measure to manage drawdown and water temperature and, if necessary, identify construction measures to release surface water in combination with the cold-water pool to reduce potential temperature effects. Therefore, with implementation of the Construction Site Water Diversion, Dewatering, and Drawdown Plan, water temperature would be less than optimal but it is expected to remain below the lethal limit for Chinook salmon and steelhead in the reach below Scott Dam to below Cape Horn Dam. Like the No-Action Alternative, the Eel River is expected to warm during the construction season as it flows downstream through the watershed due to solar radiation and inflows from unimpaired tributaries, reaching a maximum of approximately 27°C near the Middle Fork Eel River confluence area. As such, the effects of the Proposed Action would be similar to existing conditions, with some mortality of rearing juvenile salmonids possible in the lower reaches.

Adequate dissolved oxygen (DO) levels are critical for the survival of salmonids and other fish species. Salmonid species (e.g., Chinook, steelhead) typically have stricter DO requirements than other fish species, generally above 7.0 milligrams per liter (mg/L) or higher for spawning and egg incubation life stages. Reduced DO concentrations can affect the growth and development of different life stages, including eggs, alevins, and fry, as well as the swimming, feeding, and reproductive ability of juvenile and adult fish. Small changes in pH can alter the chemical state of many pollutants and change their solubility, transport, and bioavailability. This can increase exposure to and toxicity of metals and nutrients to aquatic plants and animals. Salmonids typically require pH in the range of 6.0 to 8.5. Lower or higher levels could cause mortality. During the initial low-flow season, DO and pH levels would likely mimic existing conditions while up to 400 cfs is released from the low-level outlet during the drawdown. Based on data collected in 2018 in the Eel River downstream of Scott Dam, DO would likely stay above 8 mg/L from June through October and pH would likely stay around 7 or 8. These levels of DO and pH would continue to provide suitable water quality for fish and other aquatic organisms inhabiting the Eel River between Scott Dam and Cape Horn Dam.

Short-term changes to suspended sediment could occur during initial Phase 1 dam removal activities and the drawdown of Lake Pillsbury. The 1- to 2 ft.-per-day drawdown would be expected to reduce the potential for sediment erosion in Lake Pillsbury inlets and suspended sediment releases to the Eel River; however, some increased suspended sediment and turbidity could occur. Similarly, increased turbidity could occur during dredging of sediment in front of the adit and during final removal of the dam remnants. The most common effects of suspended sediment on anadromous salmonids include (1) avoidance of turbid waters in migrating adults resulting in delay or straying, (2) avoidance or alarm reactions by juveniles, (3) displacement of juveniles, (4) reduced feeding and growth, (5) physiological stress and respiratory impairment, (6) damage to gills, (7) reduced tolerance to disease and toxicants, (8) reduced survival, and (9) direct mortality (Newcombe and Jensen 1996, as cited in Stillwater Sciences 2021a). Stillwater Sciences (2021a) also noted,

> *"[Y]earling and older salmonids can survive high concentrations of suspended sediment for considerable periods, and acute lethal effects generally occur only if concentrations exceed 20,000 mg/L."*

Relatively short-term exposure to minor increases in suspended sediment (e.g., <500 mg/L), as would be expected during Phase 1 construction, is unlikely to result in substantial direct mortality to juvenile or adult anadromous salmonids in the Eel River. Analysis of the effects of large increases in suspended sediment during flushing of Lake Pillsbury, which includes the release of approximately 12 million yd.^{3} of fine-grained sediment, is provided in the Phase 2a analysis below.

During construction, activities associated with Project facility modifications could increase the potential for accidental spills of pollutants and contamination from stormwater runoff to be introduced into the Eel River that could affect fish and aquatic species. These effects are discussed in Section 3.4.1.3, Water Quality.

To minimize the potential adverse effects related to changes to water quality on aquatic species during construction, PG&E would implement several mitigation plans, including a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; water quality best management practices (BMPs); a Stormwater Pollution Prevention Plan (SWPPP); Hazardous Materials Handling Measures; a Spill Prevention, Control, and Countermeasures (SPCC) Plan; and a Construction Erosion Prevention Plan, and would comply with federal and state construction permits (see Section 3.4.1.3). With implementation of these plans, the construction activities undertaken during this phase of the Project would have a negligible effect on water quality and thus a negligible effect on fish and aquatic resources in the Eel River downstream of Scott Dam.

Direct Loss or Disturbance of Fish and Aquatic Species

Aquatic habitat in Lake Pillsbury would transition from lacustrine to riverine during construction activities. The proposed drawdown of Lake Pillsbury of 1 to 2 ft. per day during the first low-flow season (June to October) would be expected to be protective of fish and aquatic organisms inhabiting Lake Pillsbury and the Eel River downstream of Scott Dam. These flows are within the existing range of flows released from Scott Dam during June–October. Lake Pillsbury shoreline habitats would gradually become exposed as the reservoir level drops, exposing mud flats, rocky bars, and unvegetated riparian areas. Juvenile and adult forms of mobile and semi-mobile aquatic organisms (e.g., fish, FYLF, northwestern pond turtle) would be able to relocate to wetted habitat, although some stranding of individual organisms may occur during the drawdown.

At the Scott Dam construction area, a range of activities could affect ESA threatened Chinook salmon and steelhead and other special-status aquatic species (e.g., FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) known to occur or potentially occurring in the area. Disruption of flows passing the dam into the Eel River downstream could occur (e.g., low-level outlet clogging), resulting in mortality of fish. Placement of large, clean debris from Scott Dam into the tailwater pool could injure fish and aquatic species. Steelhead coldwater summer rearing habitat between Scott Dam and Van Arsdale Reservoir may be affected (see discussion of water quality above). Work in the channel, particularly during the second low-flow season when the dam is being removed from the channel and floodplain, could result in channel dewatering and potential stranding of aquatic species (fish, FYLF, northwestern pond turtle, and mussels). Terrestrially mobile aquatic amphibians or aquatic reptiles (FYLF, northwestern pond turtle) could be present in the construction footprint and susceptible to mortality from foot, vehicle, or equipment traffic.

To protect fish and aquatic species from direct mortality and disturbance, the following measures would be implemented. PG&E would implement a Construction Site Water Diversion, Dewatering, and Drawdown Plan that would ensure redundant options would be available to release flows past Scott Dam. The plan would include construction minimum flows in the Eel River (these may be the same or different than the current Reasonable and Prudent Alternative [RPA] minimum instream flows). PG&E would implement a Construction Aquatic Species Management and Monitoring Plan that would include pre-construction surveys, periodic surveys during construction, environmental training and inadvertent discovery procedures for workers, and removal/relocation of aquatic species by qualified biologists. PG&E would also implement BMPs for work within and near aquatic habitats and the construction water quality measures identified in Section 3.4.1.3, Water Quality. With implementation of these measures, Proposed Action construction activities would have a negligible effect on fish and aquatic species.

Modification of Habitat Resulting from Construction

The Eel River from Scott Dam downstream, including the construction area, is critical habitat and EFH for Northern California Coastal DPS steelhead and California Coastal Chinook salmon. The area is the upstream terminus of anadromous habitat in the Eel River and is potential spawning and rearing habitat. Under existing conditions, the large pool area below the dam and Lake Pillsbury upstream of Scott Dam is a source of pikeminnow predation on juvenile salmonids. The construction area is also potentially habitat for other special-status species (FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) and native species such as benthic macroinvertebrates and native freshwater fish species (e.g., Sacramento sucker).

Deconstruction of Scott Dam would include removal/repositioning of riverine sediment, permanent fill of the plunge pool below the dam to the normal channel bed, and restoration of the river channel and floodplain at the dam. The modification of critical habitat and EFH within the construction footprint would require PG&E to consult with the National Marine Fisheries Service (NMFS). Additional action would likely be required (e.g., Biological Assessment, Biological Opinion). The NMFS' issuance of a Biological Opinion would authorize modifications to critical habitat/EFH and would include reasonable and prudent measures to minimize the effects of the Proposed Action on habitat, including compensatory mitigation for unavoidable adverse effects, if necessary. PG&E would obtain Clean Water Act Section 401/404 permits and comply with all conditions of the permits. A U.S. Army Corps of Engineers (USACE) 404 permit would be obtained to place fill material into waters of the United States. PG&E would develop and implement a Restoration Plan that would include measures to restore the channel, including fish passage, in the footprint of Scott Dam. With implementation of the above measures, the Proposed Action would have a beneficial effect on critical habitat, EFH, and habitat for other Eel River fish and aquatic species.

Construction would also modify Lake Pillsbury during Phase 1 activities. Lake Pillsbury shoreline habitats would gradually become exposed as the reservoir level dropped during drawdown, exposing mud flats, rocky bars, and unvegetated riparian areas. The remaining reservoir pool would temporarily result in crowded, low reservoir pool conditions for fish. The habitat would be less than ideal; however, when Lake Pillsbury is flushed of sediment, the reservoir pool would be completely dewatered except for the flowing stream segments. Restoration of Lake Pillsbury habitat to riverine habitat is addressed under Phase 2a below.

Release of Non-native Species from Lake Pillsbury

At least 12 fish species are present in Lake Pillsbury: rainbow trout (*O. mykiss*), Sacramento sucker, California roach (*Lavinia symmetricus*), Sacramento pikeminnow (*Ptychocheilus grandis*), golden shiner (*Notemigonus crysoleucas*), largemouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), catfish (*Ictalurus* spp.), brown bullhead (*Ameiurus nebulosus*), threadfin shad (*Dorosoma petenense*), and northwestern pond turtle (Section 3.3.3). Of these 12 species, only 4 are native; the remainder are introduced. Generally, these species have been found downstream in the Eel River. Some are not river species and are adapted primarily to lakes (e.g., largemouth bass), and only a few, Sacramento pikeminnow and California roach, have been observed in relatively high densities downstream. Sacramento pikeminnow and largemouth bass are the species of primary concern in Lake Pillsbury for native fish restoration (Potter Valley Fish Passage Working Group 2019). Although all non-native species may adversely affect native fish, Sacramento pikeminnow have a major effect on salmonids and other native fish in the Eel River through predation and competition for food and space (Nakamoto and Harvey 2003). Sacramento pikeminnow currently is one of the most abundant species within the Eel River fish community, and Lake Pillsbury has a large population of Sacramento pikeminnow.

Asian clams (*Corbicula fluminea*) currently occur upstream and downstream of Scott Dam. The potential for the spread of this species within the watershed is high (PG&E 2019). The biological traits of Asian clams contribute to their success as invaders. These traits include high growth rates, short life spans, high fecundity rates, self-fertilization or self-cloning (parthenogenesis), and unique dispersal mechanisms (Crespo *et al.* 2015). Asian clams can live out of water for prolonged periods of time and be spread through many natural and human-related processes. The most prominent effects of Asian clams in North American rivers are that at high densities they can alter benthic substrates and outcompete native benthic taxa (USFWS 2011).

Construction activities have the potential to increase the spread of invasive species present in Lake Pillsbury (e.g., pikeminnow) after the drawdown due to crowding of species in the reduced-size reservoir and the potential for the lowered dam/spillway to increase spills. During the winter season following the drawdown of Lake Pillsbury, the elevation of the Scott Dam spillway would be lowered and there would be a significant likelihood of spills occurring when inflows exceed the capacity of the low-level outlet. These spills would potentially transport non-native species over the dam and downstream into the Eel River. Under existing conditions, spills during the winter when the reservoir volume is low are not typical. Subsequent to these spills, when Lake Pillsbury would be flushed of sediment (adit blasted open) (see Phase 2a), the non-native species would be released regardless.

PG&E would implement the Construction Non-native Invasive Aquatic Species Management Plan, which would evaluate potential options to minimize the spread of non-native species. It is not, however, anticipated that the plan would include an option to reduce the effect of release of non-native species to less than adverse. Release of non-native species due to Proposed Action construction would have an unavoidable adverse effect on aquatic species in the Eel River.

Proposed Action construction may adversely affect the overall distribution of non-native species in the watershed; however, the anticipated benefits of converting the Eel River to a free-flowing system along with the removal of migration barriers for native fish, including special-status salmonid species and the opening of habitat upstream of Lake Pillsbury to these species are expected to outweigh the adverse effects of the dispersal of non-native fish species.

Cape Horn Dam Area

Cape Horn Dam construction activities include temporary access roads; installing channel-spanning cofferdams upstream and downstream of the dam to isolate the work area; constructing a bypass channel to temporarily reroute the Eel River; draining water from the work area; removing accumulated sediment from areas immediately upstream of the dam; removing the concrete gravity portion of the dam using land-based heavy equipment such as hydraulic high-traction excavators, hoe rams, and/or drilling and blasting; lowering the existing wingwall and earthen portion of the dam; and removing the existing fish exclusion barrier, fish hotel, and fish ladder. The Eel-Russian Project Authority would construct a New Eel-Russian Facility (NERF) near the existing diversion intake to prepare for future water diversions to the East Branch Russian River (see Section 3.5, Non-Project Use of Project Lands). Phase 1 construction would be completed when PG&E removes the cofferdams and releases water and upstream sediment through the newly opened channel. The new channel would be passable to upstream migrating fish.

<u>Modified Fish Attraction Flows and Fish Passage at Cape Horn Dam</u>

Flows released from the low-level outlet at Scott Dam (i.e., 400 cfs) during the Lake Pillsbury drawdown could alter fish attraction flows that cue anadromous fish migrations. The drawdown flows would be bypassed around Cape Horn Dam through the temporary bypass channel. The flows could be higher than existing average monthly flows under the No-Action Alternative (i.e., 100 to 200 cfs), which could result in false attraction of migrating salmonids past spawning tributaries such as Tomki and Outlet creeks. These effects are described above under Scott Dam Area effects and would be addressed by implementing the Construction Site Water Diversion, Dewatering, and Drawdown Plan to protect salmon (Chinook and coho) from untimely migratory behavior. The plan may include diversion of flow into the East Branch Russian River at Cape Horn Dam. Cape Horn Dam construction would not affect the attraction flows.

Cape Horn Dam construction could, however, affect management of fish and fish passage in a negative way due to loss of fish capture/management infrastructure. During removal of Scott Dam, release of sediment downstream would cause mortality of adult fish, redds, fry, and juveniles in the mainstem Eel River (see Phase 2a effects below). Any fish that would have migrated into the reach upstream (l1.8 mi.) or downstream (34.7+ mi.) of Cape Horn Dam would be lost. Currently, when migratory anadromous species arrive at Cape Horn Dam, the fish ladder and the Van Arsdale

Fisheries Station facilities provide a mechanism to manage migration into the reach above Cape Horn Dam and a mechanism to capture fish. If the bypass channel constructed around Cape Horn Dam provides unconstrained upstream passage or if the existing fish ladder and Van Arsdale Fisheries Station are not accessible to fish, then managing migration into the reach above Cape Horn Dam or managing fish capture, relocation, and broodstock rescue at Van Arsdale Fisheries Station would not be possible. In the winter/spring following deconstruction of Cape Horn Dam, an entire cohort of Chinook salmon, steelhead, and Pacific lamprey adults, redds, and juveniles could be lost.

Steelhead adults arrive at the fish ladder at Cape Horn Dam December through May, Chinook salmon typically arrive October through December, and Pacific lamprey typically arrive April through July. During the fall / winter of 2024, 893 Chinook salmon (639 adults, 170 jacks) were observed at the Van Arsdale Fisheries Station (November to December). The first steelhead were observed in early December 2024. In the recent past, the annual total number of Chinook salmon and steelhead has typically been fewer than 600. During Proposed Action construction, the annual fish migration would either pass unconstrained into the reach above Cape Horn Dam (through the flow bypass channel or main channel if the cofferdams have been removed) or be blocked below the dam (if the cofferdams are still in place and the bypass channel does not provide passage) and there would be no mechanism to manage the fish. The Construction Aquatic Species Management and Monitoring Plan would be implemented prior to release of sediment from Scott Dam and would include measures to implement fish salvage, capture, relocation, and broodstock rescue. The ability to implement the plan could be compromised based on the existing plan for Cape Horn Dam deconstruction. As a result, Cape Horn Dam construction would have an unavoidable adverse effect on threatened Chinook salmon and steelhead. Similarly, Pacific lamprey arriving in the spring/summer, at the beginning of Cape Horn Dam construction, would also be adversely affected.

PG&E would engage with resource agencies to develop additional measures in the Construction Aquatic Species Management and Monitoring Plan to address the issue described above. This may include construction of a temporary fish station in the bypass channel to manage migration and capture of fish, or it could include modification of the construction plan. For example, the downstream cofferdam and/or sequencing of removal of the fish ladder/Van Arsdale Fisheries Station could be modified. The current fish exclusion weir could possibly function as the downstream cofferdam for the majority of the deconstruction and then be removed as a last step of construction. This would require routing bypass flows through the existing fish ladder (pipeline on river left instead of a bypass channel on river right). The mechanism to address the fish passage/migration management issue is currently unresolved but is likely tractable. With implementation of the Construction Aquatic Species Management and Monitoring Plan and/or a modified Cape Horn construction plan, fish passage at Cape Horn Dam could have a negligible effect on management of ESA-listed Chinook salmon and steelhead and other migratory species such as Pacific lamprey.

Changes in Water Quality and Effects to Aquatic Species

Short-term changes to DO, temperature, pH, and suspended sediment could occur in the Eel River near Cape Horn Dam during construction activities. Potential pollutant spill risk and contamination from stormwater could also occur as a result of construction. These issues are addressed in Section 3.4.1.3, Water Quality. The water quality effects would be negligible with implementation of construction measures, including a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; construction BMPs; an SWPPP; a Construction Erosion Prevention Plan; hazardous materials handling measures; an SPCC Plan; and required compliance with state and federal construction permits. With implementation of these plans, Proposed Action construction activities would have a negligible effect on fish and aquatic species in the Eel River below Cape Horn Dam.

Direct Loss or Disturbance of Fish and Aquatic Species

ESA threatened Chinook salmon and steelhead and other special-status aquatic species (e.g., FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) are known to occur in Van Arsdale Reservoir and the Eel River in the vicinity of Cape Horn Dam (Section 3.3.3). During the May–October construction season, a variety of life stages (adult holding/rearing, juvenile rearing, spawning/reproduction, and migratory) could be present in the construction area, except that spawning of threatened and endangered Chinook salmon and steelhead would occur during the late fall/winter/spring period, outside the construction season.

Construction activities at Cape Horn Dam (constructing the river bypass, installing cofferdams, dewatering the work area, removing sediment) would result in modifications to the river that could cause mortality of or disturbance to aquatic species within the construction footprint. Dewatering of the channel between the cofferdams would strand fish and other aquatic species. Vehicle traffic, construction equipment, and foot traffic could impact aquatic species that may be present in the construction footprint or enter the construction area. Potential disruption of flow past Cape Horn Dam could dewater a portion of the Eel River downstream of the construction area and result in species mortality.

PG&E would implement measures to reduce potential direct effects (mortality, harassment) on fish and aquatic species. PG&E would develop and implement a Construction Aquatic Species Management and Monitoring Plan that would include pre-construction surveys, capture, and relocation of individuals. For the dewatering process, the plan would include rescue/salvage and relocation of aquatic species (fish, FYLF, northwestern pond turtle, and mussels). Following dewatering, construction activities would occur in the dry; therefore, riverine fish species, western pearlshell mussels, and other aquatic macroinvertebrates would not be present in the construction footprint. Mobile aquatic amphibians or aquatic reptiles could re-enter the dewatered construction area (e.g., FYLF, northwestern pond turtle) and be affected (e.g., mortality). The Construction Aquatic Species Management and Monitoring Plan would include periodic surveys during construction, environmental training and inadvertent discovery procedures for workers, as well as removal/relocation of aquatic species by qualified biologists. PG&E would also implement

General Wildlife Measures that include measures that would avoid entrapment of amphibians and Riparian and Wetland Protection Measures that would require BMPs for work within and near aquatic habitats. PG&E would implement a Construction Site Water Diversion, Dewatering, and Drawdown Plan to ensure continued bypass of flows downstream of the construction site. With implementation of these measures, Proposed Action construction activities would have negligible direct effects on Chinook salmon, steelhead, and other special-status/native aquatic species.

Modification of Habitat Resulting from Construction

The Eel River in the Cape Horn Dam construction area is critical habitat for Chinook salmon and steelhead and EFH for Chinook salmon. Chinook salmon and steelhead are known to occur in or near the proposed construction area, using the area primarily as a migratory corridor and/or as rearing habitat. Under existing conditions, Van Arsdale Reservoir is a source of pikeminnow predation on juvenile salmonids. The construction area is also habitat for other special-status species (FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) and native species such as benthic macroinvertebrates and native freshwater fish species (e.g., Sacramento sucker).

Removal of Cape Horn Dam and associated facilities (e.g., exclusion weir, fish hotel, fish ladder) would include modification of the river and river channel. Removal of Van Arsdale Reservoir would occur when the construction cofferdams are removed. Natural flows would flush sediments from the former reservoir (see Phase 2a). The entire construction area would be converted back to a river channel and floodplain. A NERF pump station would be constructed on the river left, upstream of the dam and is analyzed separately in Section 3.5, Non-Project Use of Project Lands.

The removal of Cape Horn Dam and Van Arsdale Reservoir would restore critical habitat and EFH physical and biological features (habitat for holding, spawning, rearing, migration). There would be a local loss of northwestern pond turtle habitat and habitat for other species in the reservoir due to construction; however, ample habitat exists in river pools upstream and downstream. PG&E would consult with NMFS to ensure that construction actions would not adversely modify designated critical habitat or EFH. Additional action would include the preparation of a Biological Assessment and NMFS issued Biological Opinion. The NMFS' issuance of a Biological Opinion would authorize modifications to critical habitat/EFH and would include reasonable and prudent measures to minimize the effects of the Proposed Action on the habitat. PG&E would obtain Clean Water Act Section 401/404 permits and comply with all conditions of the permits. A USACE 404 permit would be obtained to dredge within waters of the United States. PG&E would develop and implement a Restoration Plan that would include measures to restore the channel, including fish passage, in the footprint of Cape Horn Dam and Van Arsdale Reservoir. With implementation of the above measures, the Proposed Action would have a beneficial effect on critical habitat, EFH, and habitat for other Eel River fish and aquatic species.

Release of Non-native Species from Van Arsdale Reservoir

Van Arsdale Reservoir is small (390 ac-ft) but it is an existing "hot spot" for non-native fish predation (pikeminnow, bass) on Chinook and steelhead juveniles. Construction at Cape Horn Dam would include the dewatering of a portion of the reservoir. Non-native species such as

Sacramento pikeminnow and largemouth bass that occur in the dewatered channel would not be salvaged and relocated. The removal of non-native species would be a benefit of the Proposed Action. To minimize the potential effects of the Proposed Action on the release of non-native species, PG&E would implement a Construction Non-native Invasive Aquatic Species Management Plan that would specify management activities for non-native species. With implementation of this plan, Proposed Action construction activities would have a beneficial effect on the release of non-native species.

East Branch Russian River

Changes in Water Quality and Effects to Aquatic Species

Special-status aquatic species (FYLF, northwestern pond turtle, and western pearlshell mussels), stocked rainbow trout, common native and non-native fish species, and benthic macroinvertebrates occur in the East Branch Russian River. During deconstruction of Scott Dam and Cape Horn Dam, Lake Pillsbury storage would be drawn down from approximately June (approximately 50,000 ac-ft of storage) to October (approximately 10,000 ac-ft of storage). To the extent possible, timing of drawdown (flow releases) would be coordinated with water demands in the East Branch Russian River. During drawdown, water temperature, turbidity, and suspended sediment in the Eel River may be elevated (see above), which would affect the quality of water diverted to the East Branch Russian River. Diversion capacity at the Van Arsdale Diversion due to construction activity may not be available to maintain the current RPA minimum flows in the Eel River or East Branch Russian River, which could affect water temperature. Changes in water temperature and water quality in the East Branch Russian River could affect special-status species, including mortality.

PG&E would develop an East Branch Russian River Diversion Plan, which could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction (and potentially to minimize unwanted attraction flows for migratory salmonids). PG&E would also include a Construction Diversion, Dewatering, and Drawdown Plan to manage water temperature in the Eel River and water quality and erosion control measures that would be implemented at the Scott Dam and Cape Horn Dam construction locations. Construction measures include BMPs, a Construction Erosion Prevention Plan, an SWPPP, and an SPCC Plan, and PG&E would obtain applicable resource agency and construction permits (see Section 3.4.1.3, Water Quality). With implementation of these mitigation measures, the effects on water temperature, water quality, and special-status species (FYLF, northwestern pond turtle, and western pearlshell mussels) in the East Branch Russian River would be negligible.

Direct Loss of Aquatic Species and Habitat

Special-status aquatic species (FYLF, northwestern pond turtle, and western pearlshell mussels), stocked rainbow trout, common native and non-native fish species, and benthic macroinvertebrate habitat is maintained by diversions from the Eel River. Altered hydrology in the Eel River could affect flows in the East Branch Russian River (see discussion of hydrology above), which could result in direct loss of species and/or habitat. As discussed above, the timing of drawdown (flow releases) from Lake Pillsbury would be coordinated with water demands in the East Branch Russian River so that the effects of the Proposed Action on fish and aquatic resources in the East Branch Russian River are minimized. PG&E would develop an East Branch Russian River Diversion Plan, which could include pumping to the diversion tunnel, if needed, to provide diversions during construction. With implementation of the East Branch Russian River Diversion Plan, the Proposed Action would result in a negligible loss of special-status aquatic species (FYLF, northwestern pond turtle, and western pearlshell mussels) and other aquatic species present in the river.

Phase 2: Post-facility Removal Effects

This section analyzes the effects of Phase 2 decommissioning activities on fish and aquatic resources. Phase 2 includes the removal of the temporary adit at Scott Dam, releases of water and sediment from Lake Pillsbury, the removal of the Cape Horn cofferdams, and post-removal restoration activities (i.e., restoration of the remnant reservoirs in Lake Pillsbury and Van Arsdale Reservoir). The Phase 2 effects are categorized into Phase 2a: Initial Conditions and Preliminary Restoration and Phase 2b: Resulting Conditions and Restoration effects.

The following potential effects to fish and aquatic resources as a result of Phase 2 post-facility removal were evaluated:

Phase 2a: Initial Conditions and Preliminary Restoration:

- Changes in water quality and effects to aquatic species;
- Fish passage in the Eel River;
- Release of non-native species from Lake Pillsbury and Van Arsdale Reservoir;
- Modification of habitat for aquatic species in the Eel River downstream of Lake Pillsbury; and
- Effects on East Branch Russian River aquatic species and habitat.

Phase 2b: Resulting Conditions and Restoration:

- Fish passage, anadromous fish migrations, and access to historical habitat in the Eel River;
- Modification of habitat downstream of Lake Pillsbury; and
- Effects on East Branch Russian River aquatic species and habitat.

Phase 2a: Initial Conditions and Preliminary Restoration

Phase 2a includes the release of accumulated sediment from behind Scott Dam and Cape Horn Dam during the initial high-flow season. It is anticipated that as much as 12 million $yd.^3$ of fine-grained sediment would be mobilized into the Eel River downstream of Scott Dam within approximately 1 week (Stillwater Sciences 2021b). Most entrained sediment from Lake Pillsbury would be fine-grained (e.g., silts, clays) that would move through the Eel River without major deposition; however, sand from the reservoir would deposit along the river. Removal of the Cape Horn cofferdams would result in a relatively small release of accumulated sediments into the Eel River. Sediment trapped behind Cape Horn Dam is primarily coarse-grained, and therefore, most of it would likely settle out relatively quickly as it travels downstream. Additional mobilization of impounded sediment from behind Scott Dam and/or Cape Horn Dam would be expected following the second low-flow and second high-flow seasons, especially during precipitation or as unstable, exposed shorelines slump into the riverbed. The amount of sediment mobilized following dam removals has not been quantified but is expected to be minor compared to the amount mobilized during initial sediment flushing activities. As noted in Section 3.3.7, Geomorphology, the Eel River has the highest recorded average suspended sediment load per unit area of any river of its size or larger in the conterminous United States.

Changes to Water Quality and Effects to Aquatic Species

As described above in the Phase 1: Short-term Construction Effects section, water temperature, DO, suspended sediment concentration, and pH are all critical water quality parameters for the survival of salmonids and other aquatic species. Elevated water temperature, low DO, high suspended sediment concentrations, and changes in pH can all adversely affect fish health and result in mortality depending on the severity and duration of the event.

*Water Temperature****

Following removal of the adit plug at Scott Dam, the Eel River would return to unimpaired flow conditions, which would increase water temperature in the summer and decrease water temperature in the winter in the Eel River downstream of Scott Dam. Water temperature in the Eel River at the E2 gage (downstream of Scott Dam) could increase (up to 8.5°C) from approximately May through the end of August compared to existing conditions (No-Action Alternative) based on recent data from 2020–2023. Water temperatures at this location from September through January would be cooler (up to 5°C) when compared to existing conditions. It is expected that water temperature would exceed temperatures suitable for over-summering salmonids in drier years. This would be an adverse effect on summer water temperature and over-summering steelhead juveniles for a distance of approximately 11 miles (mi.) below Scott Dam. However, because dam removal would provide passage into previously inaccessible, high-quality aquatic habitat upstream of Scott Dam (Eel River, Rice Fork, Salmon and Smokehouse creeks) (Section 3.3.3, Table 3.3.3-2) and because the amount of potential habitat that would be made available upstream of Scott Dam (50+ mi.) exceeds the potential 11 mi. of habitat lost (Section 3.3.3.4, Table 3.3.3-2), the overall effect of the Proposed Action would be beneficial.

Dissolved Oxygen

During the initial flushing of sediment from behind Scott Dam, DO would be expected to be severely depleted downstream of Scott Dam, potentially reaching 0.0 mg/L for 1 to 2 days as the plume of sediment released from behind the dam travels downstream (see Section 3.4.1.3). DO concentrations downstream of the dam would be reduced due to the mobilization and downstream transport of anoxic reservoir sediments with high biological and chemical oxygen demand. Low DO conditions would ameliorate with surface reaeration and as tributary water mixes with the anoxic water. Especially downstream of the Middle Fork Eel River, inflowing freshwater would increase the DO concentration. Low DO, down to 0.0 mg/L, would be expected to extend at least 50 mi. downstream of Scott Dam to at least the Middle Fork Eel River. High DO demand would also occur downstream of Cape Horn Dam upon removal of the Cape Horn cofferdams and release of stored sediment, but the effect would be considerably smaller than that expected after the removal of Scott Dam (see Section 3.4.1.3). On the Klamath River in January of 2024 when sediment was released, DO was 0.0 mg/L from Copco No. 1 Dam downstream to Walker Bridge (42 mi.; U.S. Geological Survey [USGS] river mile [RM] 156.3) for 1 to 2 days. DO was depressed from 11 mg/L down to 5 mg/L as far as 70 mi. downstream at Seiad Valley (USGS RM 128.5).

Anoxic conditions resulting from the Proposed Action would be expected to have lethal effects on all fish and aquatic organisms and life stages (adult, juvenile, fry, redds) inhabiting the Eel River from Scott Dam to the Middle Fork Eel River and potentially farther downstream. These species include ESA-listed Chinook salmon, steelhead, and coho, special-status lamprey spp., western pearlshell mussels, FYLF, Sacramento sucker, green sturgeon, benthic invertebrates, and other native species. Species and life stages in tributary streams (steelhead, some Chinook salmon, coho salmon, FYLF) or species/individuals capable of surviving temporarily in semi-terrestrial habitat (FYLF, northwestern pond turtle) would not be affected. The lethal effects of the Proposed Action are unavoidable with rapid removal of Scott Dam (or other removal options). The distance and duration of the effects may be modified by the flow conditions during sediment release and the rate of sediment release. Regardless of the exact flow conditions present at the time of the adit blast, significant adverse effects to fish and aquatic resources are anticipated in the Eel River. PG&E would implement measures to partially mitigate these effects. The Post-dam Removal Aquatics Species Management and Monitoring Plan would include measures to capture/salvage, relocate, and implement broodstock rescue of aquatic species. The details would be developed with resource agencies. The goal would be to create a process whereby re-establishment of Eel River species would occur as quickly as possible and genetic diversity would not be lost. Tributary streams and the Eel River/tributaries upstream of Lake Pillsbury would help recolonize species affected by removal of Scott Dam. Broodstock rescue and relocation (e.g., upstream of Lake Pillsbury) would be an essential component of this plan. The Proposed Action would have a significant, unavoidable adverse effect on the direct loss of fish and aquatic species (special-status and native) in the Eel River from Scott Dam down to the Middle Fork Eel River confluence or farther (depending on flow conditions during the sediment release) due to low DO concentrations.

Suspended Sediment/Turbidity

As described in Section 3.4.1.4, Water Quality, and Section 3.4.1.8, Geomorphology, Stillwater Sciences (2021b) developed a two-phase conceptual model (TPCM) to evaluate the movement of fine sediments (clay and silt) resulting from the draining of Lake Pillsbury during dam removal. The clay and silt would be expected to have low potential for deposition and would be transported to the estuary in a relatively short amount of time. The movement of up to 12 million yd.^{3} of fine sediment from Lake Pillsbury was calculated to take 0.8 day at a discharge of 5,000 cfs, 2.9 days at a discharge of 2,000 cfs, and 7.7 days at a discharge of 1,000 cfs. The calculated suspended sediment concentrations below Scott Dam at the same discharges (5,000 cfs, 2,000 cfs, and 1,000 cfs) were 900,000 mg/L, 612,500 mg/L, and 457,800 mg/L, respectively. These are extremely high concentrations but possible. At Condit Dam, removal of 2.1 million yd.^{3} of fine sediment resulted in hyper-concentrated slurries of 850,000 mg/L for about 2 hours (Wilcox *et al.* 2014). During historical suspended sediment sampling in the Eel River at Scotia (RM 20.8), the suspended sediment concentration rarely exceeded 10,000 mg/L. Concentrations are expected to decrease in downstream reaches. For example, Stillwater Sciences (2021a) assumed about 30 percent dilution at the Middle Fork Eel River. Section 3.4.1.3 and Table 3.4.1.3-2 show average monthly dilution factors in a downstream direction. Figure 3.4.1.4-1 shows the approximate sediment concentration based on the dilution factors.[1] Dilution at Scotia could be about 92 percent (147 mi. downstream of Scott Dam). Nevertheless, modeled suspended sediment concentrations could still be extremely high, 40,000 mg/L or higher (Figure 3.4.1.4-1; also see Section 3.4.1.2 and Tables 3.4.1.3-1 and 3.4.1.3-2 in Section 3.4.1.3).

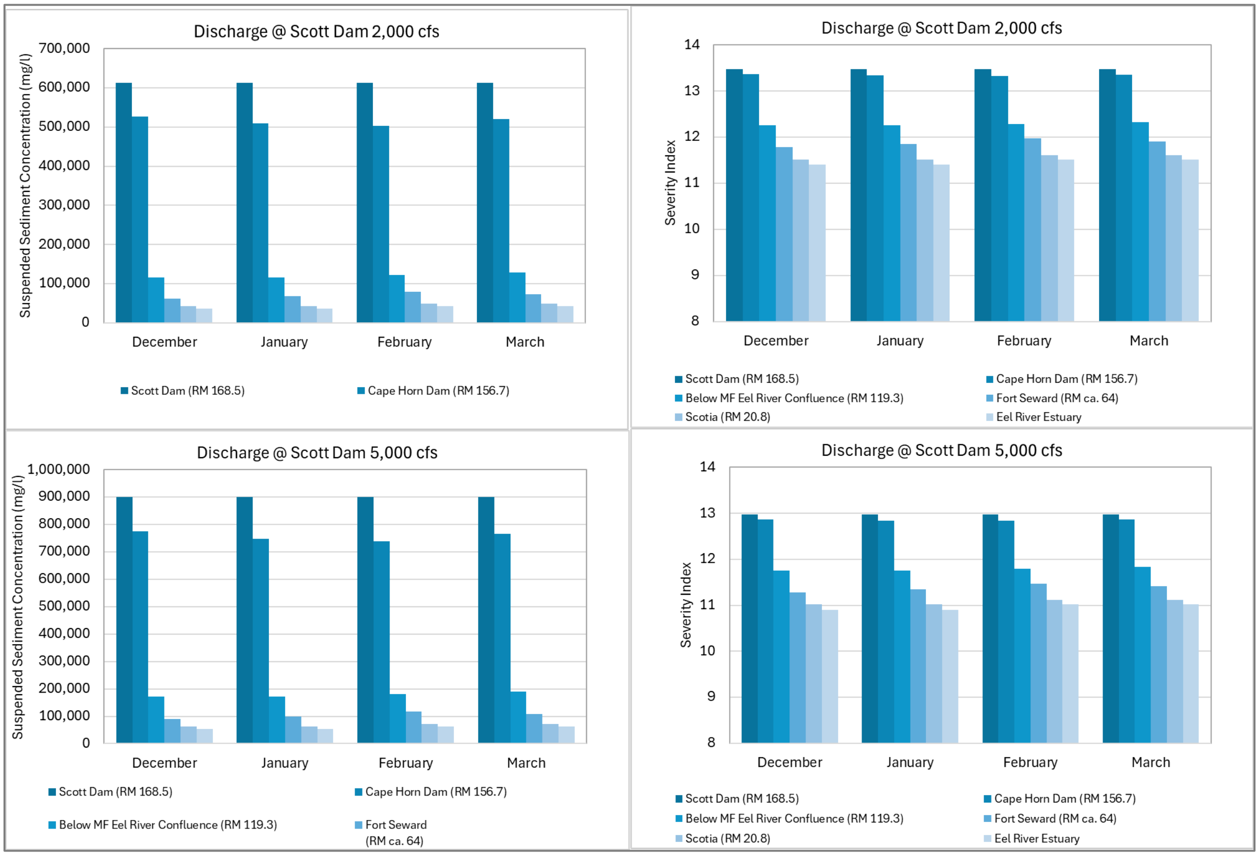


Figure 3.4.1.4.-1. Proposed Action effects of fine sediment releases from Scott Dam on suspended sediment mg/L along the Eel River (left) and the biological Severity Index (SEV) of Newcombe and Jensen (1996) (right) for release flows of 2,000 cfs and 5,000 cfs at Scott Dam.

[1] The dilution factors are estimates based on average monthly flows. During storm events, the factors may vary from average annual flows and the dilution factors do not account for variation in natural suspended sediment in the system. They assume the same concentration upriver and downriver.

Newcombe and Jensen (1996) developed a dose-response severity of ill effects (SEV) scale for salmonids and non-salmonids in relation to suspended sediment duration and concentration. The 2,000 cfs and 5,000 cfs initial Scott Dam suspended sediment concentrations and durations listed above were used with the dilution factors along the Eel River (Table 3.4.1.4-1) to calculate the SEV for salmonid adults, juveniles, eggs, and larvae and non-salmonid adults, eggs, and larvae in freshwater and estuarine water for the months of December, January, February, and March. Figure 3.4.1.4-1 shows the SEV for juvenile and adult salmonids in freshwater. The minimum and maximum SEV values and mortality for other salmonid life stages and for non-salmonid species/life stages are shown in Table 3.4.1.4-2 (Newcombe and Jensen 1996). The table shows the estimated maximum SEV and the estimated maximum mortality for salmonids and non-salmonid species at Scott Dam and the minimum SEV and minimum mortality that would occur at the estuary. The SEV for the Proposed Action would range from approximately 13.8 at Scott Dam to 9.3 at the estuary. An SEV index of 13.5, for example, has an estimated mortality of >76 to 96 percent, and an SEV of 9.3 has an estimated effect of reduced growth and density. The Proposed Action would result in high mortality of juvenile and adult Chinook salmon, coho salmon, and steelhead along the length of the Eel River and of salmonid species in the estuary (Table 3.4.1.4-2). Non-salmonid special-status fish species as well as other native species would also be severely affected.

Table 3.4.1.4-1. Hydrology-based suspended sediment concentration dilution factors for the Eel River (1925–2023 hydrology; see Section 3.3.1).

Month	Eel River Mean Monthly Flow and Dilution Factor (concentration original X dilution factor = new concentration)											
	Scott Dam (RM 168.5)		Cape Horn Dam (RM 156.7)		Below MF Eel River Confluence (RM 119.3)		Fort Seward (RM ca. 64)		Scotia (RM 20.8)		Eel River Estuary (RM 7.0)	
	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor	Mean Monthly (cfs)	Dilution Factor
October	58	--	63	0.92	264	0.22	486	0.12	724	0.08	838	0.07
November	275	--	326	0.84	1,609	0.17	2,839	0.1	4,732	0.06	5,436	0.05
December	976	--	1,132	0.86	5,228	0.19	9,595	0.1	14,664	0.07	16,366	0.06
January	1,435	--	1,728	0.83	7,518	0.19	12,910	0.11	19,870	0.07	22,089	0.06
February	1,537	--	1,867	0.82	7,561	0.2	12,193	0.13	19,812	0.08	21,935	0.07
March	1,220	--	1,427	0.85	5,876	0.21	10,282	0.12	15,181	0.08	16,860	0.07
April	795	--	933	0.85	4,124	0.19	5,982	0.13	9,456	0.08	10,528	0.08
May	369	--	432	0.85	2,196	0.17	2,753	0.13	4,147	0.09	4,637	0.08
June	132	--	152	0.87	667	0.2	875	0.15	1,436	0.09	1,604	0.08
July	38	--	43	0.88	141	0.27	207	0.18	382	0.1	423	0.09
August	17	--	19	0.89	47	0.36	78	0.22	157	0.11	174	0.1
September	19	--	20	0.95	43	0.44	81	0.23	146	0.13	163	0.12

Table 3.4.1.4-2. Proposed Action effects of fine sediment (suspended sediment mg/L) on salmonid and non-salmonid species and life stages.

Taxon	Salmonid	Salmonid	Salmonid	Salmonid & Non-salmonid	Non-salmonid	Non-salmonid
Life Stage	Juvenile & Adult	Adult	Juvenile	Eggs & Larvae	Adult	Adult
Life History	Freshwater	Freshwater	Freshwater	Freshwater & Estuarine	Estuarine	Freshwater
Sediment Particle Size	Fine & Coarse	Fine & Coarse	Fine	Fine	Fine	Fine
Maximum Severity Index (SEV) (Scott Dam)	13.5	13.8	13.2	12.5	N/A	10.9
Maximum Mortality (Scott Dam)	>70–90%	>76–96%	>64–84%	>50–70%	N/A	>18–38%
Minimum Severity Index (SEV) (Estuary)	11.0	11.5	10.7	10.4	12.2	9.3
Minimum Mortality (Estuary)	>20–40%	>30–50%	>14–34%	>8–28%	>44–64%	Reduced growth/ density

Note: The maximum effect occurs below Cape Horn Dam, and the least effect is based on flow dilution along the Eel River at the estuary (160 mi. downstream). Data are based on Stillwater Sciences (2021b), Newcombe and Jensen (1996), and mean monthly hydrology estimates.

The release and entrainment of accumulated sediment from behind Scott Dam would result in lethal effects on aquatic species inhabiting the mainstem Eel River downstream of Scott Dam and Cape Horn Dam during and immediately following the release of sediments from Lake Pillsbury and Van Arsdale Reservoir. The extreme high suspended sediment concentration would be of short duration (days) but could potentially have lasting effects on fish stocks and aquatic species. The effect is assumed to be unavoidable. Modeling designed to simulate spreading the release of sediment over 4 years (Stillwater Sciences 2021a) resulted in similarly large effects spread over 4 years. PG&E would implement measures to partially mitigate the effects of dam removal. The Construction and Post-dam Removal Aquatics Species Management and Monitoring plans would include measures to capture/salvage, relocate, and implement broodstock rescue of aquatic species. The details would be developed with resource agencies. The goal would be to create a process whereby re-establishment of Eel River species occurs as quickly as possible and genetic diversity is not lost. Tributary streams and the Eel River/tributaries upstream of Lake Pillsbury would help recolonize species. Broodstock rescue and relocation (e.g., upstream of Lake Pillsbury) would be essential components of the plan. The Estuary Protection Plan would include water quality monitoring prior to, during, and after the dam removals and monitoring for potential sedimentation in the estuary that may occur, as well as define a process for developing additional measures, if needed. Elevated turbidity may occur during subsequent high-flow events as the remainder of the sediments are remobilized and carried out to the ocean for 1 to 3 years. The Proposed Action would have a large, unavoidable adverse effect on fish and aquatic species (direct loss) due to high suspended sediment concentrations.

pH

Potential fluctuation of pH in the Eel River would be possible as a result of Phase 2a post-facility release of sediment from Scott Dam and Cape Horn Dam. pH could exceed the range suitable for fish and aquatic resources. Data from the removal of Copco No. 1 Dam as part of the Klamath River Dam removal project indicate that effects to pH were relatively moderate and of short duration. pH measured downstream of Copco No. 1 Dam dropped from 7.5 to a minimum of 6.4 after dam removal and took 2 weeks to fully recover (USGS 2024a). Data from the removal of J.C. Boyle Dam as part of the Klamath River Dam removal project also indicate that effects to pH were relatively minor and of short duration. pH was measured 6 mi. downstream of J.C. Boyle, and pH dropped from 8 to a minimum of 7.1 and remained below 7.7 for about 1 day (USGS 2024b). Fluctuations in pH would be likely to occur during the release of sediment from Scott Dam and Cape Horn Dam and post-release are expected to be within the range of pH typically tolerated by salmonoids (6.0 to 8.5). It is anticipated that pH would typically remain in the range of 6.5 to 8.5 identified in the Basin Plan (NCRWQCB 2018). Therefore, the Proposed Action would have a negligible effect on special-status salmonids and other special-status species, including native species.

Fish Passage in the Eel River

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs. It is uncertain whether upstream fish passage would be present through the Scott Dam adit tunnel immediately after (spring/summer) the reservoir is drained based on natural fluvial processes. Extensive channel erosion through the reservoir sediment from the Eel River, the Rice Fork, and Salmon and Smokehouse creeks (reservoir tributaries) would occur. PG&E would implement the Sediment/Channel Monitoring and Response Plan and Restoration Plan, and as soon as the adit is opened and storage is draining/drained, locations where natural fluvial processes were not eroding the sediment in a way that provided fish passage would be identified and measures to remove fish passage impediments or barriers with mechanized equipment, as needed, would be implemented. Final removal of Scott Dam would occur during the second low-flow season after sediment flushing. It is anticipated that full upstream fish passage would occur through the former Lake Pillsbury during that fall season. Upstream fish passage is anticipated to occur at Cape Horn Dam and through the former Van Arsdale Reservoir after the cofferdams are removed.

Release of sediment (sand in particular) from Lake Pillsbury and Van Arsdale Reservoir could affect upstream fish passage into Eel River tributaries if sediment blocks the tributary entrances. Also, several critical riffles exist in the Eel River downstream of Cape Horn Dam under existing conditions that affect anadromous fish migration. Passage at these critical riffles could be adversely affected by sediment deposition. The Sediment/Channel Monitoring and Response Plan would include monitoring of the tributary mouths and critical riffles and include a timely response plan to mobilize hand crews or equipment to open passage by removing/repositioning sediment, as necessary.

Removal of the dams would restore pre-dam upstream passage and restore full downstream passage. Implementation of the Sediment/Channel Monitoring and Response Plan and the Restoration Plan would include monitoring of fish passage in the former reservoirs, dam removal sites, and tributary confluences downstream of Scott and Cape Horn dams and measures to restore passage if passage is not present. The Proposed Action, with implementation of the monitoring and restoration measures, would have a beneficial effect on upstream and downstream passage for Chinook salmon, steelhead, lamprey, and native fish, including providing connectivity for recolonization of habitat by aquatic organisms (e.g., fish, amphibians, benthic invertebrates, algae).

Release of Non-native Species from Lake Pillsbury and Van Arsdale Reservoir

As discussed in Phase 1: Short-term Construction Effects, populations of at least eight non-native species inhabit Lake Pillsbury and have potential to be released into the Eel River when the adit is removed from Scott Dam. These species have typically been found in the river upstream and downstream and/or are lake species not well adapted to riverine habitat. Predatory Sacramento pikeminnow and largemouth bass (typically a lake species) are the species of primary concern in Lake Pillsbury for native fish restoration (Potter Valley Fish Passage Working Group 2019), and release of a large population of pikeminnow downstream is the primary concern related to predation in the Eel River. The release of non-native species will coincide with the period of extreme suspended sediment concentrations and low DO that would likely result in significant mortality to fish released from the reservoir or in the Eel River downstream of Scott Dam (see Changes to Water Quality and Effects to Aquatic Species above). Some of the non-native fish, however, may survive by remaining upstream of the sediment plume. A much smaller population of predatory non-native fish at Van Arsdale Reservoir would also be released when the cofferdams are removed at Cape Horn Dam. PG&E would implement the Construction Non-native Invasive Aquatic Species Management Plan, which would evaluate options to minimize the spread of non-native species. It is not anticipated, however, that the plan will include an option to reduce the effect of release of non-native species to less than adverse. Release of non-native species due to the Proposed Action removal of Scott Dam and Cape Horn Dam would have an unavoidable adverse effect on aquatic species in the Eel River.

Modification of Habitat for Aquatic Species in the Eel River Downstream of Lake Pillsbury

The release of 12 million $yd.^3$ of sediment that has accumulated behind Scott Dam and up to 1.65 million $yd.^3$ behind Cape Horn Dam has the potential to adversely affect aquatic habitat in the Eel River (filling of pools, fine sediment in spawning gravels, etc.). Removal of the dams also has the potential to affect habitat in the vicinity of the dams (sediment in the former reservoirs). The Proposed Action would also modify fish passage (see Fish Passage in the Eel River above).

Sediment Deposition in the Eel River

Clay and silt materials are expected to be transported through the river to the ocean. Some settling of silt and clay may occur in slow-water areas downstream (backwaters, channel margins, floodplains) and deposit within the interstitial spaces of coarser substrate, but this material would be relatively entrainable by spring/winter high-flow events and transported farther downstream to the ocean. Clay and silt deposits are not expected to adversely affect riverine habitat except temporarily.

Sand deposition, however, may affect habitat from Scott Dam to approximately the Middle Fork Eel River confluence. In the reach from Scott Dam to Cape Horn Dam, sand deposition could initially be several feet thick and concentrated in and near Van Arsdale Reservoir, primarily between Cape Horn Dam (RM 156.8) to about 3 mi. upstream to RM 160. Sand deposition would temporarily adversely affect channel morphology. It would likely lead to partial or complete filling of pools and burial of coarse channel substrate that would diminish aquatic habitat. Sand deposition would adversely affect pool holding/rearing habitat and spawning habitat for anadromous salmonids, Pacific lamprey, and FYLF and habitat for mussels and benthic invertebrates. The elevated sediment deposition would be temporary, as subsequent high-flow events through restored, unimpaired Eel River hydrology following the dam removals would remobilize most of the deposited sand and flush accumulated sediment from pools and coarse channel substrate. This could take a number of years and would depend on the natural hydrology. A large, wet water year could transport sand quickly versus multiple low-flow water years, which would take longer. Gravel deposition from the dam removals is anticipated to occur within or in proximity to the reservoirs and is expected to be beneficial to aquatic habitat. The Proposed Action would have a short-term unavoidable adverse effect on habitat due to sand and sediment deposition in the Eel River for special-status fish and aquatic species and native species.

Habitat in the Former Reservoirs and Dam Sites

Riverine habitat within the former reservoirs and dam sites would initially consist of accumulated fine sediment and incising river channels. Without management, the channels could become deeply incised without proper floodplains, riparian habitat, natural pool/riffle sequencing, and spawning habitat. PG&E would implement the Sediment/Channel Monitoring and Response Plan and the Restoration Plan, which would include measures to restore the channels, floodplains, and riparian vegetation in the former reservoirs and dam sites. The Lake Pillsbury area reportedly was historically a high-quality spawning area for anadromous fish. With the restoration measures, the Proposed Action would have a beneficial effect on habitat for fish and aquatic habitat.

Re-establishment of Upstream Historical Habitat

Following the opening of Scott Dam and removal of the cofferdams at Cape Horn Dam, fish passage would be re-established (see Fish Passage in the Eel River above). Habitat in the tributaries upstream of Scott Dam, including the Eel River, the Rice Fork, and Salmon and Smokehouse creeks and their associated tributaries, would be available to Chinook salmon, steelhead, and Pacific lamprey. Section 3.3.3.4 identifies the amount of habitat available upstream of the dam. Under existing conditions, the fish ladder at Cape Horn Dam periodically becomes filled with sediment during high flows and becomes non-functional. With removal of the dam, unconstrained fish passage would be restored. The Proposed Action will have a beneficial effect on Chinook salmon, steelhead, and Pacific lamprey by re-establishing access to 50+ mi. of spawning and rearing habitat (Section 3.3.3.4, Table 3.3.3-2).

Effects on East Branch Russian River Aquatic Species and Habitat

As described in Section 3.4.1.2, Water Use and Hydrology, following loss of storage at Scott Dam, water would not be diverted to the East Branch Russian River. As such, flows in the East Branch Russian River would be unimpaired (see Table 3.3.1-16 and Figures 3.3.1-13 and 3.3.1-14 in Section 3.3.1). Mean summer August flow would change from 126 cfs under existing conditions to 1 cfs with the Proposed Action at Calpella, California. There would be an almost complete loss of flow and aquatic habitat, resulting in direct loss of aquatic species. Potential future diversion to the East Branch Russian River by the NERF pump station is addressed in Section 3.4.2, Cumulative Effects Analysis. The Proposed Action would have an unavoidable adverse effect on special-status aquatic species (FYLF, northwestern pond turtle, western pearlshell mussels), the stocked trout fishery, and benthic macroinvertebrates and aquatic habitat in the East Branch Russian River.

Phase 2b: Resulting Conditions and Restoration

Phase 2b of the Proposed Action includes post-dam removal restoration and the resulting restored condition in the watershed. The effects of Phase 2b are expected to be permanent and significantly beneficial to fish and aquatic resources in the Eel River in comparison to the No-Action Alternative, which would result in continued delays or barriers to migratory fish, impaired hydrological conditions, modified geomorphological and habitat formation processes, modified water quality (i.e., DO and pH), and modified water temperature regimes.

Fish Passage, Anadromous Fish Migrations, and Access to Historical Habitat

Under existing conditions, fall-run Chinook salmon, coho salmon, steelhead, and Pacific lamprey are able to access much of the Eel River and its tributaries (e.g., spawning, rearing, and migration); however, migratory fish are unable to access historical habitat upstream of Scott Dam. Anadromous fish may also be delayed or turned back at Cape Horn Dam due to the fish ladder, although recent improvements to the Fish Hotel have minimized instances of delay or turn back. The presence of these barriers and the effects of the artificial release of colder water from Lake Pillsbury in the spring altering juvenile outmigration timing have been identified as limiting factors to run sizes of anadromous fish in the Eel River. Following removal of both dams, the Eel River would be free-flowing, providing unimpeded upstream and downstream passage of anadromous fish. Removal of the dams would allow Chinook salmon, steelhead, and Pacific lamprey to reach historical riverine habitats located above Scott Dam. Fifty-plus mi. of spawning and rearing habitat (Section 3.3.3.4, Table 3.3.3-2) are present above Scott Dam. The resulting condition would also provide improved access for anadromous fish and resident fish to tributaries upstream of the former Cape Horn Dam site because it is likely that more spawning fish will pass the former Cape Horn Dam site. Increased access to riverine habitat would be expected to increase the numbers of naturally produced salmon and steelhead in the Eel River as well as resident fish. Therefore, the Proposed Action would benefit special-status species (Chinook salmon, steelhead, Pacific lamprey) populations by improving fish passage and access to habitat in the upper Eel River (upstream of Cape Horn and Scott dams).

Modification of Habitat Downstream of Lake Pillsbury

The Proposed Action would result in unimpaired fish passage, unimpaired hydrology, natural water quality and water temperature conditions, restored sediment supply downstream of the Scott and Cape Horn Dam sites, access to habitats upstream of Scott Dam, and connectivity of habitats in the Eel River. The Proposed Action would result in a long-term significant beneficial effect to critical habitat, particularly for species that utilize the upper Eel River (Chinook salmon and steelhead), and EFH for Chinook salmon and coho salmon. The improved conditions would benefit habitat for a range of special-status species (lamprey spp., FYLF, western pearlshell mussels, green sturgeon) and perhaps other species listed in Section 3.3.3.11, including native species (e.g., Sacramento sucker). Reservoir habitat for non-native predatory species (e.g., pikeminnow) would be removed. Habitat benefits may extend farther downstream to species/populations in the lower Eel River and estuary.

Effects on East Branch Russian River Aquatic Species and Habitat

The long-term effects of the Proposed Action on the East Branch Russian River are the same as those described above under Phase 2a. The Proposed Action would have an unavoidable adverse effect on special-status aquatic species (FYLF, northwestern pond turtle, western pearlshell mussels), the stocked trout fishery, and benthic macroinvertebrates and aquatic habitat in the East Branch Russian River due to loss of flow.

Dam Removal Sequencing Options

Two alternate sequencing options to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below:

- Option 1: The Scott Dam adit plug is removed in a year prior to the removal of Cape Horn Dam.
- Option 2: Cape Horn Dam and the cofferdams are removed in a year prior to the removal of Scott Dam.

These options contrast with the Proposed Action whereby PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season and remove the adit plug at Scott Dam and the Cape Horn Dam cofferdams simultaneously or in close sequence to flushing sediment from the reservoirs.

Alternate Sequencing Option 1

Phase 1: Construction Effects

The construction-related effects to fish and aquatic resources of alternate sequencing option 1 (removing Scott Dam prior to Cape Horn Dam removal) would be the same as for the Proposed Action except for one effect. The proposed Project sequencing unavoidable adverse effect of losing fish capture/management infrastructure at Cape Horn Dam prior to an entire year class (cohort) of Chinook salmon, steelhead, and Pacific lamprey arriving at Cape Horn Dam (these fish would be lost due to Scott Dam removal) would not occur under alternate sequencing option 1.

Phase 2a: Initial Conditions and Preliminary Restoration

Under alternate sequencing option 1, the Scott Dam adit plug would be removed and sediment from Lake Pillsbury would be flushed downstream prior to removal of Cape Horn Dam. Under this scenario, it is expected that effects on fish and aquatic resources would be the same as those for the Proposed Action sequencing except for one effect. Similar to the Proposed Action sequencing, there would be an unavoidable adverse effect on DO and suspended sediment due to release of Lake Pillsbury sediment, a loss of fish and aquatic species along 50 mi. of the Eel River due to low DO, and a partial loss of fish and aquatic species in the remainder of the river and estuary due to high suspended sediment concentrations, but alternate sequencing option 1 sequencing would include an additional, much smaller unavoidable adverse effect in a later year due to removal of Cape Horn Dam and the release of sediment from Van Arsdale Reservoir.

Phase 2b: Resulting Conditions and Restoration

Phase 2b effects on fish and aquatic resources resulting from removing Scott Dam prior to Cape Horn Dam would be the same as for the Proposed Action, but the Proposed Action sequencing would remove the dams and restore fish and aquatic species habitat along the Eel River in 1–2 years, whereas alternate sequencing option 1 sequencing would restore flow and water quality habitat to natural conditions in 3–4 years.

Alternate Sequencing Option 2

Phase 1: Short-term Construction Effects

The construction-related effects to fish and aquatic resources of alternate sequencing option 2 sequencing (removing Cape Horn Dam prior to Scott Dam removal) would be the same as for the Proposed Action sequencing.

Phase 2a: Initial Conditions and Preliminary Restoration

If Cape Horn Dam (including the cofferdams) were removed prior to the removal of Scott Dam, the overall effect on fish and aquatic resources would be similar to the Proposed Action sequencing but the effects would occur in 2 separate years instead of 1 year. There would be a smaller unavoidable adverse effect on water quality and fish mortality below Cape Horn Dam when it is removed and sediment is released, and then in a subsequent year, a much larger unavoidable adverse effect on water quality and fish mortality in the Eel River would occur when Scott Dam is removed.

Phase 2b: Resulting Conditions and Restoration

Phase 2b effects on fish and aquatic resources resulting from removing Cape Horn Dam prior to Scott Dam would be the same as for the Proposed Action sequencing, but the Proposed Action sequencing would remove the dams and restore fish and aquatic species habitat along the Eel River in 1–2 years, whereas alternate sequencing option 2 sequencing would restore flow and water quality habitat to natural conditions in 3–4 years.

Construction and Environmental Measures

To avoid or reduce the effects of the Proposed Action on fish and aquatic resources during construction, PG&E would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.1.

- Construction Site Water Diversion, Dewatering, and Drawdown Plan
- East Branch Russian River Diversion Plan
- Construction Aquatic Species Management and Monitoring Plan
- Construction Non-native Invasive Aquatic Species Management Plan
- Construction Water Quality and Water Temperature Monitoring Plan
- Water quality and construction BMPs
- SWPPP
- Hazardous Materials Handling Measures
- SPCC Plan
- Construction Erosion Prevention Plan
- Compliance with federal and state construction permits

To avoid or reduce the effects of the Proposed Action on fish and aquatic resources during facility removal (Phase 2), PG&E would implement the following post-facility removal measures. A complete list of environmental measures is included in Section 2.2.3.2.

- Sediment/Channel Monitoring and Response Plan
- Restoration Plan
- Post-construction Water Quality and Water Temperature Monitoring Plan
- Post-dam Removal Aquatic Species Management and Monitoring Plan
- Estuary Protection Plan

Unavoidable Adverse Effects

Phase 1: Short-term Construction

Unavoidable adverse effects to fish and aquatic resources include the following:

- Short-term unavoidable adverse effect from the release of non-native species, including Sacramento pikeminnow and largemouth bass from Lake Pillsbury into the Eel River during winter spill events following the lowering of Scott Dam; and
- Short-term unavoidable adverse effect from removal of fish capture/management infrastructure at Cape Horn Dam prior to an entire year class (cohort) of Chinook salmon, steelhead, and Pacific lamprey arriving at Cape Horn Dam could result in loss of the entire cohort and jeopardize the ability to implement Construction Aquatic Species Management and Monitoring Plan measures to provide fish salvage, capture, relocation, and broodstock rescue.
- In the long-term removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam.

Phase 2a: Initial Conditions and Preliminary Restoration

Unavoidable adverse effects to fish and aquatic resources resulting from Phase 2a include the following:

- Short-term unavoidable significant adverse effect from the direct loss of all fish and aquatic species (special-status and native) in at least 50 mi. of the Eel River below Scott Dam due to low DO during the release of sediment from Lake Pillsbury and Van Arsdale Reservoir (special-status species include Chinook salmon, steelhead, Pacific lamprey, FYLF, northwestern pond turtle, western pearlshell mussels, lamprey spp., green sturgeon, coho salmon);
- In the long-term, removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to fifty-plus miles of spawning and rearing habitat above Scott Dam and restoring natural hydrology and sediment processes in the Eel River.
- Short-term unavoidable adverse effect from the direct loss of a percentage of fish and aquatic species (special-status and native) along the 168.5 mi. of the Eel River below Scott Dam, including the estuary, due to high suspended sediment concentrations during the release of sediment from Lake Pillsbury and Van Arsdale Reservoir (special-status species include Chinook salmon, steelhead, Pacific lamprey, FYLF, northwestern pond turtle, western pearlshell mussels, lamprey spp., green sturgeon, coastal cutthroat trout, coho salmon, and species in the lower Eel River and estuary);
- In the long-term, removal of the dams would benefit fish and aquatic species by improving access for anadromous fish and resident fish to 50+ mi. of spawning and rearing habitat above Scott Dam and restoring natural hydrology and sediment processes in the Eel River

- Short-term unavoidable adverse effect to fish and aquatic resources from the release of non-native species, including Sacramento pikeminnow and largemouth bass from Lake Pillsbury into the Eel River during winter spill events during the release of storage and sediment from Scott Dam;
- Short-term unavoidable adverse effect resulting from sediment deposition in channel pools and spawning habitats in the Eel River as a result of releasing accumulated sediment from Lake Pillsbury and Scott Dam; and
- Long-term unavoidable adverse effect in the East Branch Russian River resulting from the loss of special-status species (FYLF, northwestern pond turtle, western pearlshell mussels) because diversions to the East Branch Russian River would no longer occur under the Proposed Action.

Phase 2b: Resulting Conditions and Restoration

Unavoidable adverse effects to fish and aquatic resources include the following:

- Long-term unavoidable adverse effect in the East Branch Russian River resulting from the loss of special-status species (FYLF, northwestern pond turtle, western pearlshell mussels) because diversions to the East Branch Russian River would no longer occur under the Proposed Action.

References

Crespo D., M. Dolbeth, S. Leston, R. Sousa, and M.A. Pardal. 2015. Distribution of *Corbicula fluminea* (Müller, 1774) in the invaded range: a geographic approach with notes on species traits variability. Biological Invasions 17: 2,087–2,101. DOI: 10.1007/s10530-015-0862-y.

FERC (Federal Energy Regulatory Commission). 2022. Final environmental impact statement for hydropower license surrender and decommissioning of the Lower Klamath Project—FERC Project No. 14803-001 Klamath Hydroelectric Project—FERC Project No. 2082-063, Oregon and California.

Kubicek, P.F. 1977. Summer water temperature conditions in the Eel River system, with reference to trout and salmon. MS Thesis. Humboldt State University, Arcata, CA 200 pp.

Nakamoto, R.J., and B.C. Harvey. 2003. Spatial, seasonal, and size-dependent variation in the diet of Sacramento pikeminnow in the Eel River, northwestern California. California Fish and Game 89: 30–45.

NCRWQCB (North Coast Regional Water Quality Control Board). 2018. Water quality control plan for the North Coast region. May. Available at: Basin Plan Documents | California North Coast Regional Water Quality Control Board.

Newcombe, C.P., and J.O.T. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16:3: 693–727.

NMFS (National Marine Fisheries Service). 2002. Biological opinion for the proposed license amendment for the Potter Valley Project (FERC Project Number 77-110). NMFS Southwest Region. November 26.PG&E (Pacific Gas & Electric). 2019. Technical Study Report AQ 11- Special-Status and Invasive Aquatic Molluscs.

Potter Valley Fish Passage Working Group. 2019. Potter Valley Project Ad Hoc Committee fish passage profiles evaluation report. Available at: pottervalleyproject.org/wp-content/uploads/2019/12/Fish-Passage-Evaluation-Report_FINAL.pdf.

Richter, A., and S.A. Kolmes. 2005. Maximum temperature limits of Chinook, coho, and chum salmon and steelhead trout in the Pacific Northwest. Reviews in Fisheries Science 13:23–49.

Stillwater Sciences. 2021a. Analyses of fine sediment erosion effects on aquatic species following the proposed Scott Dam removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

Stillwater Sciences. 2021b. Analyses of fine sediment erosion following the proposed Scott Dam removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

USFWS (U.S. Fish and Wildlife Service). 2011. Asian clam (*Corbicula fluminea*) ecological risk screening summary. Available at: fws.gov/sites/default/files/documents/Ecological-Risk-Screening-Summary-Asian-Clam.pdf.

USGS (U.S. Geological Survey). 2024a. Water Data for the Nation – Klamath R AB Fall C NR Copco CA – 11511990. USGS. Available at: https://waterdata.usgs.gov/monitoring-location/11511990.

USGS (U.S. Geological Survey). 2024b. Water Data for the Nation – Klamath River Below John C. Boyle Powerplant, NR Keno, Or – 11510700. USGS. Available at: https://waterdata.usgs.gov/monitoring-location/11510700.

Wilcox, A.C., J.E. O'Connor, and J.J. Major. 2014. Rapid reservoir erosion, hyperconcentrated flow, and downstream deposition triggered by breaching of 38 m tall Condit Dam, White Salmon River, Washington. Journal of Geophysical Research: Earth Surface 119(6): 1,376–1,394. Available at: https://doi.org/10.1002/2013jf003073.

TABLE OF CONTENTS

List of Acronyms

BMP	best management practice
CALVEG	Classification and Assessment with LANDSAT of Visible Ecological Groupings
cfs	cubic feet per second
CRPR	California Rare Plant Rank
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture – Forest Service
ft.	foot/feet
mi.	mile(s)
MNF	Mendocino National Forest
NWI	National Wetlands Inventory
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
USFWS	U.S. Fish and Wildlife Service

This Page Intentionally Left Blank

3.4.1.5 Botanical Resources

This section describes the potential effects to botanical resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning of Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Post-facility removal effects are split into phases: Phase 2a – Initial Conditions and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration. Refer to Section 3.4.1.1 for a description of each phase.

The effects are determined by analyzing the changes in botanical resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1). Analysis of the Proposed Action considers removal of Scott Dam and removal of Cape Horn Dam within the same construction season, as described in Section 2.2. In addition, potential dam removal sequencing options are qualitatively analyzed at the end of the Phase 1: Short-term Construction Effects section. This includes analysis of the potential effects of (1) removal of Scott Dam prior to the removal of Cape Horn Dam and (2) removal of Cape Horn Dam prior to the removal of Scott Dam to provide flexibility in dam removal sequencing following completion of engineering design.

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

This section evaluates the potential effects of construction activities on botanical resources (including special-status plants and invasive weeds) and riparian and wetland habitats. Refer to Section 3.3.4, Table 3.3.4-2, for a list of special-status plant species known to occur in the Analysis Area. Refer to Section 3.3.4, Table 3.3.4-4, for a list of invasive weeds known to occur in the Analysis Area. Refer to Section 3.3.4.4 for a discussion of riparian and wetland habitats known to occur in the Analysis Area. The baseline Analysis Area for short-term construction effects includes the Scott Dam Area and Cape Horn Dam Area, which each include two construction areas:

- The Scott Dam Area construction areas include (1) the Scott Dam and ancillary support facility (necessary for dam removal) construction area and (2) the ancillary facility (not necessary for dam removal) and recreation facility construction area.
- The Cape Horn Dam Area construction areas include (1) the Cape Horn Dam and ancillary support facility (necessary for dam removal) construction area and (2) the ancillary facility (not necessary for dam removal) construction area.

The baseline Analysis Area is further defined under the Botanical Resources and Riparian and Wetland Resources sections below.

The baseline Analysis Area for post-facility removal effects encompasses the larger Eel River and Russian River watersheds and is detailed in the post-facility removal section below.

The following potential effects to botanical resources resulting from construction-related activities were evaluated:

Botanical Resources

- Direct loss of special-status plant individuals or populations during construction
- Indirect effects through loss or degradation of habitat, including the introduction or spread of invasive weeds, during construction

Riparian and Wetland Resources

- Direct reduction in the amount of riparian habitat (e.g., through trimming or removal) during construction
- Indirect effects to riparian and wetland habitat on the shoreline of Lake Pillsbury from reservoir drawdown during construction
- Indirect effects to riparian and wetland habitat downstream of the dam sites from increased erosion and hazardous material spills potentially resulting from construction activities

A discussion of potential construction effects to botanical resources that could occur as a result of implementation of the Proposed Action, with incorporation of construction measures, is provided below by area. In addition, potential effects of removal of Cape Horn Dam prior to the removal of Scott Dam are also qualitatively analyzed to provide flexibility in decommissioning of the Project following completion of engineering design. Unavoidable adverse effects from construction are also discussed at the end of this section.

Botanical Resources

This section evaluates potential effects of construction activities on botanical resources, including plant species listed under the Endangered Species Act (ESA). This includes potential direct and indirect effects to special-status plants (including effects from the introduction or spread of invasive weeds).

The Analysis Area for effects to botanical resources is defined to include the boundaries of the construction work, access, staging, and stockpile areas, as defined in Section 2.2. Refer to Section 3.3.4, Table 3.3.4-2, for a list of special-status plants known to occur or potentially occurring in the vicinity of the Project and their status and habitat requirements. Section 3.3.4, Table 3.3.4-4, provides a list of invasive weed populations identified in the vicinity of the Project. Refer to Section 3.3.4, Maps 3.3.4-2a–i and Map 3.3.4-3, for the locations of known populations of special-status plants and invasive weeds, respectively, in relation to Project dams, ancillary facilities, recreation facilities, and Lake Pillsbury and Van Arsdale Reservoir.

For the purposes of this analysis, a special-status plant is defined as a species listed, proposed, or under review as rare, threatened, or endangered by the federal or state government; those designated by the U.S. Department of Agriculture – Forest Service (Forest Service) as sensitive or watchlist species with the Mendocino National Forest (MNF); and/or those on the California Department of Fish and Wildlife's Special Vascular Plants, Bryophytes, and Lichens List with a California Rare Plant Rank (CRPR) of 1 or 2.

For the purposes of this analysis, invasive weeds are those rated by the California Department of Food and Agriculture as A, B, or on the California Code of Regulations 4500 Noxious Weed List and those listed by the MNF Priority Ranking. Invasive weeds listed by MNF would only be addressed on MNF lands.

Provided below is an evaluation of potential direct and indirect effects to special-status plants, separated by geographic area.

Scott Dam Area

Four special-status plant species were documented in the Scott Dam Area during botanical studies completed in the Federal Energy Regulatory Commission (FERC) Project boundary in 2018 (PG&E 2019a). Populations were found in the following locations:

- Three-fingered morning glory (*Calystegia collina* ssp. *tridactylosa*) (CRPR 1B.2) – one population was identified along the southeast shore of Lake Pillsbury within the FERC Project boundary.
- Greene's narrow-leaved daisy (*Erigeron greenei*) (CRPR 1B.2) – one population was identified along the southeast shore of Lake Pillsbury within the FERC Project boundary.
- Glandular western flax (*Hesperolinon adenophyllum*) (CRPR 1B.2) – six populations were identified in the Scott Dam Area, including three populations along Scott Dam Road near the dam, two populations on the south shore of Lake Pillsbury in the FERC boundary, and one population near the Fuller Grove Day Use Area and Boat Launch.
- Grooved beard lichen (*Sulcaria badia*) (Forest Service Sensitive, CRPR 4.2) – one population was found near the Eel River Visitor Information Kiosk.

While not identified during surveys in 2018, suitable habitat is present for an additional 20 special-status plants that may potentially occur in uplands and 6 special-status plants that may potentially occur in riparian areas and/or wetlands.

Potential direct and indirect effects to special-status plants from construction activities are provided below.

Direct Effects

Construction activities required for the decommissioning of Scott Dam, Project recreation facilities, and Project ancillary facilities may potentially affect special-status plants, if present within the construction work areas. For example, use of heavy equipment or placement of stockpiled material could crush or bury special-status plant individuals.

In order to address and reduce the potential for direct effects to special-status plant populations (either previously known or newly established), PG&E will implement the Special-status Plant Construction Measures. These measures require PG&E to implement a special-status plant survey within a 100-foot (ft.) buffer of all construction areas in the year prior to construction. If special-status plant populations are found, PG&E will flag populations prior to each year of ground-disturbing construction activities or will implement site-specific measures considering the life history of the special-status plant species in relation to the work being conducted. Examples of site-specific measures may include, but are not limited to, implementing work following the seed set and senescence of annual plants or during the dormant phase of perennial plants. In addition, PG&E would implement General Construction Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures. Refer to Section 2.2.3, Table 2-14, for additional details of these measures.

With implementation of construction measures, construction would have temporary and negligible direct effects on special-status plants in the Scott Dam Area.

Indirect Effects

Potential indirect effects to special-status plants include degradation of habitat from ground disturbance and the spread or introduction of invasive weed populations.

Construction activities will create ground disturbance and will require use of heavy equipment, which could potentially result in destabilization and erosion of soils within work areas. Effects to soil stability could potentially degrade habitat for native vegetation, including special-status plants. Indirect effects to special-status plants would be short-term and temporary. In addition, as described further in Phase 2 – Post-facility Removal Effects below, PG&E would implement the Restoration Plan following construction to restore disturbed areas following facility removal. Therefore, any indirect effects to special-status plants would be negligible.

Thirteen invasive weed species are known to occur in the Scott Dam Area. Transporting construction vehicles and heavy equipment to work, access, staging, and stockpile areas, as well as foot traffic associated with construction activities, could result in the spread of previously established invasive weed populations or introduce new invasive weed populations into the work areas. The potential for the introduction or spread of invasive weeds will be addressed and reduced through implementation of the Invasive Weed Construction Measures. These measures require PG&E to conduct invasive weed surveys the year before construction. During construction, PG&E will implement measures to prevent the spread or introduction of invasive weeds, such as cleaning off-road equipment to ensure it is free of soil and plant parts prior to arrival at the construction sites; minimizing soil disturbance as much as possible; driving and parking on established roads to the extent possible; maintaining gravel and spoil piles in a weed-free state; using weed-free areas for staging and laydown; properly containing and transporting any invasive weed–infested materials to a landfill; using certified weed-free erosion control materials; restoring sites with a native seed mix; seeding topsoil stockpiles with a native seed mix if left for longer than a month; cleaning clothing, footwear, and gear before moving from an infested area to a non-infested area; and avoiding invasive weed–infested areas or prioritizing activities such that invasive weed–infested areas are worked last. PG&E will also implement the General Construction Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures. Refer to Section 2.2.3, Table 2-14, for additional details of these measures.

With implementation of construction measures, indirect effects to special-status plants from the spread or introduction of invasive weeds would be negligible.

Cape Horn Dam Area

Two special-status plant species were documented in the Cape Horn Dam Area during botanical studies completed in the FERC Project boundary in 2018 (PG&E 2019a). Populations were found in the following locations:

- Three-fingered morning glory (CRPR 1B.2) – one population was identified along Tunnel No. 1 between Cape Horn Dam and the Potter Valley Powerhouse.
- Glandular western flax (CRPR 1B.2) – five populations were identified in the Cape Horn Dam Area, including four populations along the Penstock, Pipeline, and Butterfly Valve House in the vicinity of Conduit No. 1 and one population along Penstock No. 2 between Conduit No. 2 and the Potter Valley Powerhouse.

While not identified during surveys in 2018, suitable habitat is present for 22 special-status plants that may potentially occur in uplands and 6 special-status plants that may potentially occur in riparian areas and/or wetlands.

Potential direct and indirect effects to special-status plants from construction activities are provided below.

Direct Effects

As described above under the Scott Dam Area section, use of ground-disturbing heavy equipment for construction activities and stockpiling soil could potentially crush or bury special-status plants. To address and reduce this potential effect, PG&E will implement the Special-status Plant Construction Measures, which require pre-construction surveys and flagging and avoidance of populations during construction or site-specific measures considering the life history of the special-status plant species. PG&E will also implement General Construction Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures.

With implementation of these measures, potential direct effects to special-status plants would be negligible.

Indirect Effects

As described above, construction activities will create ground disturbance and will require use of heavy equipment, which could potentially result in destabilization and erosion of soils. Soil erosion could degrade habitat for native vegetation, including special-status plants. Indirect effects to special-status plants would be short-term and temporary. In addition, as described further in Phase 2 – Post-facility Removal Effects below, PG&E would implement the Restoration Plan following construction to restore disturbed areas following facility removal. Therefore, any effects to special-status plants would be negligible.

Eight invasive weed species are known to occur in the Cape Horn Dam Area. As described above, use of ground-disturbing heavy equipment and human foot traffic have the potential to introduce or spread invasive weed populations. To reduce this potential effect, PG&E will implement the Invasive Weed Construction Measures, which require surveys for invasive weeds prior to construction and the implementation of the previously described measures to control the spread and introduction of invasive weeds. PG&E will also implement General Construction Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures.

With implementation of these measures, potential indirect effects to special-status plants from invasive weeds would be negligible.

Riparian and Wetland Resources

This section presents an evaluation of potential direct and indirect effects of construction activities on riparian and wetland resources.

The Analysis Area for effects to riparian and wetland resources is defined to include (1) the boundaries of the construction work, access, staging, and stockpile areas, as defined in Section 2.2, and (2) the shorelines of Lake Pillsbury and Van Arsdale Reservoir. Refer to Section 3.3.4.4 for a description of riparian and wetland resources in the Analysis Area. Refer to Figure 3.3.4-1 for a preliminary map of wetlands along the shoreline of Lake Pillsbury and Figure 3.3.4-2 for a preliminary map of wetlands along the shoreline of Van Arsdale Reservoir.

Provided below is an evaluation of potential direct and indirect effects to riparian and wetland resources, separated by geographic area.

<u>Scott Dam Area</u>

Riparian and wetland habitats are located both along the shoreline of Lake Pillsbury and immediately downstream of Scott Dam along the Eel River (refer to Section 3.3.3.4 for more information). Based on preliminary maps from Stillwater Sciences (PG&E 2019a), there are 32 wetlands adjacent to Lake Pillsbury, including both forested and emergent wetlands. Maps of Classification and Assessment with LANDSAT of Visible Ecological Groupings (CALVEG) communities indicate that willow (shrub) riparian communities are also present downstream of Scott Dam. Discussion of potential direct and indirect effects to riparian and wetland habitat resulting from construction is provided below.

Direct Effects

This section evaluates the potential for direct effects (e.g., removal and trimming) to riparian habitat as a result of construction activities in the Scott Dam Area. While most work, staging, and stockpile areas are located in upland habitats within the previously disturbed footprint of Project facilities, approximately 0.6 acre of riparian vegetation will be removed for extension of the existing road off Scott Dam Road that will provide access to the temporary barge launch and the downstream terminus of the existing plunge pool below the dam. This riparian vegetation is located along the bed and bank of the Eel River. To address and reduce effects to riparian habitats, PG&E would implement Riparian and Wetland Protection Measures, which requires that riparian vegetation removal be limited to the extent possible and that riparian vegetation outside of immediate construction work areas be flagged for avoidance. PG&E would also obtain Clean Water Act Section 404/401 permits/certification and implement all conditions of the permits, including any riparian protection measures. Refer to Section 2.2.3, Table 2-14, for additional details of this measure. With implementation of Riparian and Wetland Protection Measures, direct effects from riparian vegetation removal would be reduced. Nevertheless, removal of approximately 0.6 acre of riparian vegetation would be considered a temporary adverse effect. Following completion of construction, the temporary access road would be restored to prior natural condition and vegetation would be allowed to regrow. Therefore, any effects to riparian habitat would be temporary and negligible. Refer to Phase 2 – Post-facility Removal Effects for a detailed discussion of effects to riparian vegetation following facility removal.

PG&E would also implement General Construction Measures, as described above under the Botanical Resources section, which require all staff and contractors to limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures, including riparian and wetland protection measures.

With implementation of these construction measures, direct effects to riparian and wetland vegetation in the Scott Dam Area would be negligible.

Indirect Effects

Indirect effects to riparian and wetland habitats include degradation of habitat resulting from the spread of invasive weeds, degradation of riparian and wetland shoreline habitat during the Lake Pillsbury drawdown, and degradation of downstream habitat from erosion and sedimentation and hazardous materials that can affect water quality. Each of these potential effects is described below.

As described above, construction activities could potentially result in the spread of existing invasive weeds or introduce new invasive weeds into the construction areas, which could, in turn, result in the degradation of riparian and wetland habitats in the Scott Dam Area. PG&E will implement the Invasive Weed Construction Measures and General Construction Measures, as described above, to reduce impacts from invasive weeds. Refer to Section 2.2.3, Table 2-14, for additional details of these measures. With implementation of these measures, potential indirect effects to riparian and wetland habitats from invasive weeds would be negligible.

Lake Pillsbury will be drawn down in the initial low-flow season. Drawdown of the reservoir for construction would result in the reduction of the water table for riparian and wetland habitats found on the shoreline of Lake Pillsbury under existing conditions. As described in Section 2.2, the drawdown would occur slowly, with the drawdown rate being restricted to between 1 and 2 ft. per day, which would give riparian and wetland plants time to complete their life cycle before the next growing season. Furthermore, based on a study of tule elk (*Cervus canadensis nannodes*) forage in the emergent wetland along the north shore of Lake Pillsbury (PG&E 2019b), plants in these wetlands may be adapted to seasonal drying and tolerate periodic changes in water levels under existing conditions. Therefore, in the short term, any indirect effects to riparian and wetland habitat on the shoreline from the drawdown during construction (i.e., a single year) are expected to be negligible.

Use of ground-disturbing heavy equipment during implementation of construction activities could result in temporary degradation of water quality within Lake Pillsbury and in the Eel River downstream of the dam through increased erosion and sedimentation or through the release of hazardous materials including fuels or other chemicals. Such effects to water quality could degrade riparian and wetland habitats. The potential for construction-related degradation of water quality would be addressed and reduced through implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, and applicable Forest Service best management practices (BMPs). In addition, PG&E will obtain coverage under Clean Water Act Section 404/401 permits and implement Riparian and Wetland Protection Measures, which requires PG&E to implement BMPs for work within and near aquatic habitats. Such BMPs may include prohibiting refueling of equipment within 100 ft. of wetlands, streams, or waterways; using secondary containment; providing spill kits onsite; and using appropriate erosion control materials. Refer to Section 2.2.3, Table 2-14 for additional details of these measures. With implementation of these construction measures, potential effects to riparian and wetland habitats from degradation of water quality would be negligible. Effects following dam removal (including sedimentation in the Eel River Watershed) are addressed under Phase 2 – Post-facility Removal Effects below.

Cape Horn Dam Area

Riparian and wetland habitats are located both along the shoreline of Van Arsdale Reservoir and immediately downstream of Cape Horn Dam along the Eel River (refer to Section 3.3.4.4 for more information). Based on preliminary maps from Stillwater Sciences (PG&E 2019a), there are eight wetlands adjacent to Van Arsdale Reservoir, including both forested and emergent wetlands. Mapping of CALVEG communities indicates that willow (shrub) riparian communities are also present downstream of Cape Horn Dam. A discussion of potential direct and indirect effects to riparian and wetland habitat resulting from construction is provided below.

Direct Effects

This section evaluates the potential for direct effects (e.g., removal and trimming) to riparian habitat as a result of construction activities in the Cape Horn Dam Area. While most work, staging, and stockpile areas are located in upland habitats within the previously disturbed footprint of Project facilities, Cape Horn removal will require the construction of a new temporary access road to provide access to work areas near Cape Horn Dam. This temporary access road would require the removal of approximately 0.3 acre of riparian vegetation. This riparian vegetation is located along the banks of Van Arsdale Reservoir and the Eel River downstream. As described above, to reduce effects to riparian habitats, PG&E would implement Riparian and Wetland Protection Measures, which requires that riparian vegetation removal be limited to the extent possible and that riparian vegetation outside of immediate construction work areas would be flagged for avoidance. PG&E will obtain Clean Water Act Section 404/401 permits/certification and implement all conditions of the permits, including any riparian protection measures. Nevertheless, removal of approximately 0.3 acre of riparian vegetation would be considered a temporary adverse effect. Following completion of construction, the temporary access road would be restored to prior natural condition and vegetation would be allowed to regrow. Therefore, any effects to riparian habitat would be temporary and negligible. Refer to Phase 2 – Post-facility Removal Effects for effects to riparian vegetation following facility removal.

PG&E would also implement General Construction Measures, as described above, which require all staff and contractors to limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures, including riparian and wetland protection measures.

With implementation of these construction measures, direct effects to riparian and wetland vegetation in the Cape Horn Dam Area would be negligible.

Indirect Effects

Indirect effects to riparian and wetland habitats include degradation of habitat resulting from the spread of invasive weeds, dewatering within Van Arsdale Reservoir during construction, and from erosion and sedimentation and hazardous materials that can affect water quality. Each of these potential effects is described below.

As described above, construction activities could potentially result in the spread of existing invasive weeds or introduce new invasive weeds into the construction areas, which could, in turn, result in the degradation of riparian and wetland habitats in the Cape Horn Dam Area. To address and reduce these potential effects, PG&E will implement the Invasive Weed Construction Measures and General Construction Measures as described above under the Scott Dam Area section. Refer to Section 2.2.3, Table 2-14, for additional details of these measures.

With implementation of these measures, potential indirect effects to riparian and wetland habitats from invasive weeds would be negligible.

Construction of the temporary cofferdams upstream and downstream of Cape Horn Dam to dewater the work area would result in a significant reduction in the size of Van Arsdale Reservoir, which could lower the water table and reduce available water to adjacent wetland and riparian habitats during construction in the summer growing season. Riparian species, such as cottonwood, alder, and willow often exhibit drought-stress responses, which can include reduced shoot and root growth, branch sacrifice, or crown die-backs when the depth to the water table is increased. Therefore, lowering the water table during construction along the dewatered portion of Van Arsdale Reservoir could result in minor effects to riparian and wetland habitat. However, these effects would be limited to the construction period, and flows within the construction area would be restored after removal of the cofferdams after one construction season. Therefore, any effects to riparian and wetland habitat from dewatering the construction work area would be negligible. Refer to Phase 2 – Post-facility Removal Effects for a discussion of indirect effects to riparian and wetland revegetation following Cape Horn Dam removal.

As described above, use of ground-disturbing heavy equipment during implementation of construction activities could result in temporary degradation of water quality in the Eel River downstream of the dam through increased erosion and sedimentation or through the release of hazardous materials including fuels or other chemicals. Such effects to water quality could degrade riparian and wetland habitats. The potential for construction-related degradation of water quality would be addressed and reduced through implementation of Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, and applicable BMPs, and Riparian and Wetland Protection Measures, as described above under the Scott Dam Area section. Refer to Section 2.2.3, Table 2-14, for additional details of these measures.

With implementation of these measures, potential indirect effects to riparian and wetland habitats from degradation of water quality would be negligible. Effects following dam removal (including sedimentation in the Eel River) are addressed under Phase 2 – Post-facility Removal Effects.

Phase 2: Post-facility Removal Effects

This section presents an evaluation of the potential effects of physical changes that may occur following dam and ancillary/recreation facility removal on botanical resources, including special-status plants, riparian, and wetland resources.

The baseline Analysis Area for the post-facility removal section includes four primary areas:

- The Scott Dam Area – Restoration Area, which consists of the following:
  - The former Scott Dam construction areas;
  - The former Project ancillary/recreation facility construction areas; and
  - The former reservoir bed of Lake Pillsbury.

- The Cape Horn Dam Area – Restoration Area, which consists of the following:
  - The former Cape Horn Dam construction areas;
  - The former Project ancillary/recreation facility construction areas; and
  - The former reservoir bed of Van Arsdale Reservoir.
- The Eel River from the former Scott Dam to the Eel River estuary (i.e., Eel River Watershed)
- The East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino (i.e., Russian River Watershed)

The baseline Analysis Area for botanical resources and riparian and wetland habitats is further defined below in each section.

As described above, post-facility removal effects are split into phases: Phase 2a – Initial Conditions and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration. Refer to Section 3.4.1.1 for a description of each phase.

Phase 2a includes analysis of the initial temporary physical conditions that will occur immediately following dam and ancillary/recreation facility removal, including the following:

- Loss of the facility or feature (e.g., loss of reservoir, ancillary facility, or recreation facility)
- Initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam:
  - Pulse hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam until the reservoir is drained; and
  - Sediment load/deposition and turbidity in the Eel River downstream of Scott Dam and Cape Horn Dam.
- Continued degraded water quality and sediment deposition after the initial sediment release until the system stabilizes and water quality and sediment transport return to natural conditions
- Ground disturbance, use of heavy equipment, and transport of materials to and from the Scott Dam and Cape Horn Dam Area restoration areas to allow for restoration of the former dam sites and ancillary/recreation facility sites

Phase 2b includes analysis of the resulting conditions following dam and ancillary/recreation facility removal, including the following:

- Unimpaired hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam
- Restored sediment transport and water quality in the Eel River downstream of Scott Dam and Cape Horn Dam
- Natural hydrology in the East Branch Russian River
- Restored former reservoir beds and ancillary/recreation sites following facility removal

The following potential post-facility removal effects to botanical resources resulting from physical changes that occur following dam and recreation facility/ancillary facility removal were evaluated:

- Potential effects to botanical resources (including special-status plants and invasive weeds):
  - Phase 2a
    - Direct loss of special-status plant individuals or populations during restoration
    - Indirect effects through loss or degradation of habitat, including the introduction or spread of invasive weeds, during restoration
    - Indirect effects to special-status plant individuals in riparian and wetland habitats along the Eel River downstream from the initial sediment pulse
  - Phase 2b
    - Beneficial effects to special-status plants from restoration of the former reservoir beds and recreation facility/ancillary facility sites
    - Beneficial effects to plants in the Eel River Watershed from return to natural hydrology and sediment transport processes
    - Change in habitat potentially supporting special-status plants in the East Branch Russian River following re-establishment of natural flow conditions
- Potential effects to riparian and wetland resources:
  - Phase 2a
    - Direct reduction in the amount of riparian habitat or effects to riparian plant species during restoration activities
    - Potential degradation of riparian and wetland habitats during restoration of former reservoir beds and recreation facility/ancillary facility sites, including degradation resulting from the introduction or establishment of invasive weeds
    - Potential loss of riparian and wetland habitat from the shoreline of Lake Pillsbury and Van Arsdale Reservoir
    - Potential loss/burial/degradation of riparian habitat in the Eel River (downstream of Scott Dam and Cape Horn Dam) from sediment released following dam removal
  - Phase 2b
    - Beneficial effects to wetland and riparian habitat resulting from restoration of the former reservoir beds
    - Beneficial effects to riparian and wetland habitat in the Eel River downstream of the former dams from re-establishment of the natural hydrograph and sediment transport
    - Change in riparian and wetland habitat in the East Branch Russian River following re-establishment of natural flow conditions

A discussion of potential post-facility removal effects to botanical resources that could occur from facility removal, with incorporation of measures, is provided below by area.

Botanical Resources

This section presents an evaluation of potential effects of post-facility removal on botanical resources. This includes potential direct and indirect effects to special-status plants (including effects from the introduction or spread of invasive weeds).

The Analysis Area for effects to botanical resources is defined to include the following:

1) The boundaries of the Scott Dam and Cape Horn Dam Area restoration areas, including the former reservoir beds

2) Riparian and wetland habitats along the bed and bank of

    a) the Eel River to the Eel River estuary

    b) the East Branch Russian River

Refer to Section 3.3.4, Table 3.3.4-2, for a list of special-status plants known to occur or potentially occurring in the vicinity of the Project and their status and habitat requirements. Section 3.3.4, Table 3.3.4-3, provides a list of special-status plants that are known to occur or may potentially occur in riparian and wetland habitats along the Eel River from Scott Dam to the Eel River estuary and/or the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

Provided below is an evaluation of potential direct and indirect effects to special-status plants by geographic area.

<u>Scott Dam Area</u>

As described above, there are four special-status plant species—three-fingered morning glory, Greene's narrow-leaved daisy, glandular western flax, and grooved beard lichen—that are known to occur in the Scott Dam Area (PG&E 2019a). While not identified during surveys in 2018, suitable habitat is present for an additional 20 special-status plants that may potentially occur in uplands and 6 special-status plants that may potentially occur in riparian areas and/or wetlands.

Potential direct and indirect effects to special-status plants following facility removal are provided below and are separated by Phase 2a and Phase 2b.

Phase 2a

Potential direct effects from Phase 2a include direct loss of special-status plant individuals during restoration activities. Potential indirect effects include loss or degradation of habitat from the introduction of invasive weeds during restoration and potential effects to special-status plants in riparian and wetland habitats along the shoreline of Lake Pillsbury following loss of the reservoir. Each potential effect is further described in the sections below.

Direct Effects – Special-status Plant Individuals

Special-status plant populations are known to occur around existing Project ancillary and recreation facilities that would be restored, as described above for construction effects. In addition, while the majority of the former Lake Pillsbury reservoir bed would be unvegetated, the margins of Lake Pillsbury support habitat for special-status plants.

Restoration activities that require the use of heavy equipment or placement of stockpiles could crush or bury special-status plant individuals, if present in restoration work areas. To address and reduce the potential for direct effects to special-status plant populations (either previously known or newly established), PG&E will implement Special-status Plant Restoration Measures. If special-status plant populations are found during the pre- construction surveys, as described above for construction effects, PG&E will flag populations prior to each year of ground-disturbing restoration activities or will implement site-specific measures considering the life history of the special-status plant species. Examples may include working in areas that are known to have special-status species only following the seed set and senescence of annual plants or working in the dormant phase of perennial plants. In addition, PG&E would implement General Restoration Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures. Refer to Section 2.2.3, Table 2-16, for additional details of these measures.

With implementation of post-facility removal measures, Phase 2a activities would have temporary and negligible direct effects on special-status plants in the Scott Dam Area.

Indirect Effects – Invasive Weeds

Thirteen invasive weed species are known to occur in the Scott Dam Area. Invasive weeds could be introduced or spread within the restoration area through two primary mechanisms.

First, use of ground-disturbing heavy equipment or movement of restoration personnel during active restoration activities may potentially introduce new invasive weed populations or spread existing populations, if equipment or personnel are unintentionally carrying weed seeds or plant materials. The potential for the active introduction or spread of invasive weeds will be addressed and reduced through implementation of the Invasive Weed Restoration Measures, which are the same as Invasive Weed Construction Measures described above under Phase 1: Construction Effects. PG&E will also implement the General Restoration Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures. Refer to Section 2.2.3, Table 2-16, for additional details of these measures.

Second, because existing populations of invasive weeds found around the shoreline of Lake Pillsbury provide a seed source, exposed sediments within the former reservoir bed may be passively colonized by invasive weed populations, even if these areas do not receive active restoration treatments. The physical (e.g., particle-size distribution) and chemical (e.g., macronutrient and micronutrient status) character of newly exposed sediments in the former reservoir bed of Lake Pillsbury may potentially create conditions that favor growth of invasive plants (Shafroth et al. 2002). For example, soils containing high micronutrients or metal levels may favor invasive plants that are more tolerant of these ions. To reduce this potential effect, PG&E will implement the Restoration Plan, which will include measures to address invasive weeds.

With implementation of the Invasive Weed Restoration Measures, General Restoration Measures, and Restoration Plan, indirect effects to special-status plants from the spread or introduction of invasive weeds in the Scott Dam Area would be negligible.

Indirect Effects – Loss of Reservoir

The tributary-influenced zones of Lake Pillsbury support forested wetland habitats, and the northern shoreline of Lake Pillsbury, which is periodically inundated, supports both emergent wetland and upland vegetation. Several additional small wetlands were also mapped along the reservoir shoreline by Stillwater Sciences during technical studies (PG&E 2019a). These areas represent suitable habitat for six special-status plant species that grow in riparian and wetland habitats. Wetland habitats in the tributary-influenced zones would likely be preserved following removal of Scott Dam. Vegetation growing along the periodically inundated northern shoreline of the reservoir tolerates periodic changes in water levels under existing conditions and therefore is expected to persist in the near term following removal of Scott Dam but may experience some loss due to the reduction in surface water. Ground disturbance and use of heavy equipment associated with implementation of the Restoration Plan could potentially result in the temporary loss of portions of these habitats, particularly if stabilization of soils is required in these habitats along the Eel River channel or tributary channels within the reservoir bed. In the short term, there may be a temporary reduction in the availability of riparian and wetland habitats for special-status plants. Over time, additional riparian and wetland habitat is expected to establish along the tributary streams through both natural revegetation and active introduction through the Restoration Plan (refer to discussion under Phase 2b below).

Considering that no riparian and wetland special-status plants were observed during surveys in 2018 (PG&E 2019a) and that any effects to shoreline riparian and wetland habitats would be short-term, any effects to special-status plants in riparian and wetland habitats following the dewatering of Lake Pillsbury would be negligible.

Phase 2b

Potential effects from Phase 2b include beneficial indirect effects to special-status plants from restoration of the former reservoir bed of Lake Pillsbury and recreation facility/ancillary facility sites. PG&E will implement the Restoration Plan (including any required monitoring and adaptive management) to facilitate restoration of the former reservoir bed of Lake Pillsbury. Over time, it is expected that the formerly lacustrine habitat will become a more diverse mosaic of wetland, riparian, and upland habitats along the restored channel of the Eel River and tributary streams. Overall, the diversity and health of riparian and wetland ecosystems is expected to improve, benefiting special-status plants in riparian and wetland habitats. Restoration of the former Project ancillary and recreation facility sites would also allow for native vegetation to develop within previously disturbed and/or developed lands, benefiting upland special-status plants. Therefore, restoration would increase the total area of native habitats available for special-status plants to recolonize in the long term. In addition, the cessation of operations and maintenance activities and reduced recreation pressure following removal of Project facilities would reduce risk of spread of invasive weeds associated with human activities.

Therefore, with implementation of the Restoration Plan, removal of Project facilities would have a beneficial effect on habitat for special-status plants in the Scott Dam Area. Refer to Section 2.2 for more details on the goals of the Restoration Plan.

Cape Horn Dam Area

As described above, there are two special-status plant species—three-fingered morning glory and glandular western flax—that are known to occur in the Cape Horn Dam Area (PG&E 2019a). While not identified during surveys in 2018, suitable habitat is present for 22 special-status plants that may potentially occur in uplands and 6 special-status plants that may potentially occur in riparian areas and/or wetlands.

Potential direct and indirect effects to special-status plants following facility removal are provided below and are separated by Phase 2a and Phase 2b.

Phase 2a

Potential direct effects from Phase 2a include direct loss of special-status plant individuals during restoration activities. Potential indirect effects include loss or degradation of habitat from introduction of invasive weeds during restoration and potential effects to special-status plants in riparian and wetland habitats along the shoreline of Van Arsdale following removal of Cape Horn Dam. Each potential effect is further described in the sections below.

Direct Effects – Special-status Plant Individuals

Following construction activities, the former Cape Horn Dam construction area would be heavily disturbed and would not support habitat for special-status plants. There are no special-status plants known to occur or likely to occur within the former reservoir bed of Van Arsdale Reservoir or along the existing shoreline (PG&E 2019a). Therefore, special-status plants would not be affected by restoration activities within the former inundation zone.

Special-status plant populations are known to occur along existing Project ancillary facilities in the Cape Horn Dam Area. Restoration activities that require the use of heavy equipment or placement of stockpiles could crush or bury special-status plant individuals, if they occur in restoration work areas. To address and reduce the potential for direct effects to special-status plant populations (either previously known or newly established), PG&E will implement the Special-status Plant Restoration Measures and General Restoration Measures, as described above. Refer to Section 2.2.3, Table 2-16, for additional details of these measures.

With implementation of these post-facility removal measures, Phase 2a activities would have temporary and negligible direct effects on special-status plants in the Cape Horn Dam Area.

Indirect Effects – Invasive Weeds

Eight invasive weed species are known to occur in the Cape Horn Dam Area. As described above, active restoration activities have the potential to introduce new invasive weed populations or spread existing populations. The potential for the introduction or spread of invasive weeds from active restoration will be addressed and reduced through implementation of the Invasive Weed Restoration Measures and General Restoration Measures. Refer to Section 2.2.3, Table 2-16, for additional details of these measures.

Because invasive weeds have been documented around the shoreline of Van Arsdale Reservoir, exposure of soils within the former reservoir bed has the potential for passive recolonization by invasive weeds. Spread of weeds could, in turn, degrade habitat for special-status plants. To address and reduce this potential effect, PG&E will implement the Restoration Plan, which will address invasive weeds.

With implementation of the Invasive Weed Restoration Measures, General Restoration Measures, and Restoration Plan, indirect effects to special-status plants from the spread or introduction of invasive weeds in the Cape Horn Dam Area would be negligible.

Indirect Effects – Loss of Reservoir

Van Arsdale Reservoir is confined within a narrow river valley. Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic (pre-dam) condition. The first high-flow event would mobilize coarse sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the former reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The sediment release is expected to result in temporary burial of riparian and wetland vegetation, which could affect availability of habitat for special-status plants that grow in riparian and wetland vegetation.

Under existing conditions, Van Arsdale Reservoir supports forested wetlands as well as several small emergent wetlands, which may provide habitat for special-status plants. While dam removal could result in minor reductions in the extent of forested and emergent wetlands because of lower water levels or from burial in sediment, new riparian vegetation (including special-status riparian plants) may also become established in response to the sediment deposition. Therefore, effects to special-status plants resulting from temporary and minor changes in riparian and wetland habitat in the Cape Horn Dam Area would be negligible.

Phase 2b

Following mobilization of sediments, PG&E will restore the former reservoir bed consistent with the Restoration Plan. Refer to Section 2.2 for more details on the goals of the Restoration Plan. The focus of the restoration would be stabilization of the new river channel including native plantings, as necessary. Over time, the reach of the Eel River within the former Van Arsdale Reservoir is expected to return to a morphologic condition similar to pre-dam conditions. The river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. The restored Eel River in this area would continue to provide aquatic and riparian habitat for special-status plants. Restoration of the former Project ancillary and recreation facility sites would facilitate the transition of previously disturbed and/or developed habitats to native upland habitats. Therefore, restoration would increase the total area and quality of native habitats available for special-status plants to recolonize in the long term. In addition, the cessation of operations and maintenance activities following removal of the ancillary facilities would reduce risk of spread of invasive weeds associated with human activities.

Therefore, with implementation of the Restoration Plan, removal of Project facilities would have a beneficial effect on habitat for special-status plants in the Cape Horn Dam Area.

Eel River Watershed

Phase 2a and Phase 2b would not affect upland special-status plants in the Eel River Watershed; therefore, only special-status plants that may occur in riparian and wetland habitats are discussed in this section. Outside of the Cape Horn Dam and Scott Dam areas, the Eel River Watershed has not been systematically surveyed for special-status plants. While there are no records for special-status plants in riparian and wetland habitats along the Eel River downstream of Scott Dam to the confluence of the Eel River estuary, five special-status plants have the potential to occur along this reach. Seven special-status plants are known to occur in the estuarine habitats of the Eel River estuary. These species include the federally listed western lily (*Lilium occidentale*, Federal Endangered, California Endangered, CRPR 1B.1) and Lyngbye's sedge (*Carex lyngbyei*, CRPR 2B.2), Humboldt Bay owl's-clover (*Castilleja ambigua* ssp. *humboldtiensis*, CRPR 1B.1), Point Reyes salty bird's-beak (*Chloropyron maritimum* ssp. *palustre*, CRPR 1B.2), minute pocket moss (*Fissidens pauperculus*, CRPR 1B.2), Howell's montia (*Montia howellii*, CRPR 2B.2), and dwarf alkali grass (*Puccinellia pumila*, CRPR 2B.1). Two other special-status plants may also potentially occur in the Eel River estuary.

Because restoration activities would not take place within the Eel River Watershed outside of the Scott Dam and Cape Horn Dam areas described above, potential effects to special-status plants are limited to sediment release effects during Phase 2a and the return of unimpaired hydrology in the Eel River under Phase 2b. Each potential effect is described further below.

Phase 2a

As described above, Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximately 12-mile (mi.) section of the Eel River from Scott Dam to Van Arsdale Reservoir, the approximately 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the approximately 119-mi. section from the Middle Fork Eel River to the estuary. Potential effects to riparian and wetland habitats in the Eel River Watershed under Phase 2a are described below.

Special-status plants occurring in riparian and wetland habitats could be affected by the sediment pulse and suspended sediment in the Eel River following dam removal. The duration of erosion of upstream sediment during the initial high-flow event following dam removal is calculated to take from one to eight days depending on the rate of discharge. Based on sediment transport modeling completed for the Proposed Action (refer to Section 3.4.1.8), it is expected that the majority of coarse sediment will be deposited prior to the confluence with the Middle Fork Eel River. In addition, some of the suspended fine sediment may deposit and alter channel or floodplain morphology in this reach, at least temporarily until subsequent high-flow events can resuspend it and transport it farther downstream. Flow from major tributaries downstream will diminish the effect of the elevated sediment load, and it is likely that alterations to the existing channel morphology will become difficult to distinguish downstream of the confluence with the Middle Fork Eel River (located about 38 mi. downstream of Van Arsdale Reservoir).

The effects of sediment release on riparian special-status plants potentially present along the Eel River would vary based on site-specific factors including volume of discharge, distance from the point of release, and the geomorphology of the site affected. Deposition of sediment closest to the former dam sites could result in temporary burial of vegetation, particularly low-lying shrubs and herbaceous vegetation in close proximity to the river channel. Effects would occur primarily in the reach from Scott Dam downstream to Van Arsdale Reservoir and from Cape Horn Dam to the confluence with the Middle Fork Eel River. Temporary burial of special-status plants may occur if sediments are deposited in suitable habitat. While some loss of individuals is possible, new surfaces for riparian and wetland special-status plants to colonize may be created with formation of new sediment deposits or channel bars. Therefore, effects to special-status plants in this reach may be negligible, neutral, or beneficial.

Sediment deposition is expected to decrease with distance downstream from the dams and is expected to have minimal effect downstream of the Middle Fork Eel River to the Eel River estuary. Only suspended fine sediments are expected to reach the Eel River estuary. While suspended sediments have been shown to affect light availability for submerged aquatic plants such as eelgrass (*Zostera marina*) (Fonseca and Fisher 1986), none of the special-status species known or potentially occurring in the Eel River estuary are submerged plant species and would likely be unaffected by suspended sediment. Therefore, facility removal would not result in detectable changes in associated riparian or estuarine habitats for special-status plants in this reach.

Phase 2b

Phase 2b is the resulting conditions in the Eel River following restoration. From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. It is likely that the currently over-coarsened sediment gradation in the reach will become less coarse with the renewed sediment supply. Long-term aggradation may occur that raises the bed elevation profile, though much of the sediment initially deposited will likely be remobilized in subsequent floods and transported farther downstream. Temporary filling of pools may occur, and more pronounced sediment bars may form that will promote development of a more sinuous channel. Areas with existing overly dense riparian vegetation would be expected to be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. These changes in the Eel River would have a neutral to beneficial effect on habitat for special-status plants.

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River, is not likely to result in detectable long-term changes in associated riparian and estuarine habitats, and would therefore have no effect on special-status plants in this reach.

East Branch Russian River

One special-status plant species, Bolander's catchfly (*Silene bolanderi*) (CRPR 1B.2), is known to occur along the East Branch Russian River south of the Potter Valley Powerhouse. Additionally, Howell's montia may potentially occur in suitable habitat.

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the approximately 11-mi. East Branch Russian River, which runs from the powerhouse, through an alluvial valley (i.e., Potter Valley), and through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cubic feet per second (cfs) and 225 cfs, with maximum flows of about 300 cfs for the period of record (see Section 3.3.1). Based on a review of the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), riparian habitats (i.e., forested wetlands) are present, primarily along the valley portion of the river. One special-status plant species, Bolander's catchfly, is known to occur along the East Branch Russian River south of the Potter Valley Powerhouse, and Howell's montia may potentially occur in suitable habitat.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of natural flows in the East Branch Russian River would result in an intermittent flow regime in the river, and the majority of the river from the powerhouse to the ordinary high water mark of Lake Mendocino (approximately 11 mi.) would be seasonally dry. This would result in an alteration in the location and extent of riparian and wetland habitats. Upland habitats that are more tolerant of drier seasonal conditions would likely become more prevalent in the valley. While the degree of changes resulting from the Proposed Action is unknown, changes in the location and extent of these habitats may potentially reduce the amount and/or suitability of riparian habitats for special-status plants. However, considering that both Bolander's catchfly and Howell's montia can also grow in upland habitats in addition to wetland and riparian habitats, effects to these species from changes in riparian habitats in the East Branch Russian River would be negligible.

Riparian and Wetland Resources

This section presents an evaluation of potential effects of post-facility removal on riparian and wetland resources. This includes potential direct and indirect effects to riparian and wetland resources.

The Analysis Area for effects to riparian and wetland resources is defined to include the following:

1) The boundaries of the Scott Dam and Cape Horn Dam restoration areas
2) Riparian and wetland habitats along the bed and bank of
    a) the Eel River to the Eel River estuary
    b) the East Branch Russian River

Refer to Section 3.3.4.4 for more information on riparian and wetland resources known to occur in the Analysis Area.

Provided below is an evaluation of potential direct and indirect effects to wetland and riparian habitats, separated by geographic area.

<u>Scott Dam Area</u>

The tributary-influenced zones of Lake Pillsbury support forested wetland habitats, and the northern shoreline of Lake Pillsbury, which is periodically inundated, supports both emergent wetland and upland vegetation. Several additional small wetlands were also mapped along the reservoir shoreline by Stillwater Sciences during technical studies (PG&E 2019a).

Potential direct and indirect effects to riparian and wetland habitats following facility removal are provided below and are separated by Phase 2a and Phase 2b.

Phase 2a

Potential direct effects from Phase 2a include disturbance of riparian/wetland habitats during implementation of restoration activities. Potential indirect effects include (1) loss or degradation of habitat from introduction of invasive weeds during restoration, (2) loss of water available to riparian and wetland habitats along the shoreline of Lake Pillsbury, and (3) indirect effects of tule elk browsing on young riparian vegetation re-establishing within the former inundation zone. Each potential effect is further described in the sections below.

<u>Direct Effects</u>

Most restoration activities will take place within the dewatered reservoir bed of Lake Pillsbury (i.e., bare substrates), but some access may be needed along the shoreline. Restoration access routes outside of existing construction areas may require additional removal/trimming of riparian or wetland vegetation. Ground disturbance and use of heavy equipment associated with implementation of the Restoration Plan could potentially result in the temporary loss of portions of these habitats, particularly if stabilization of soil is required along the Eel River channel or tributary channels within the reservoir bed. To address and reduce this potential effect, PG&E will implement the Riparian and Wetland Protection Measures, which requires any riparian or wetland vegetation that is outside of immediate restoration areas to be flagged for avoidance prior to implementation of the restoration activities.

Additionally, implementation of the Restoration Plan may potentially require the trimming or cutting of live riparian vegetation and/or wetland plugs from existing riparian/wetland habitats in order to revegetate the former inundation zone of Lake Pillsbury. These cuttings and plugs would then be transplanted along the Eel River and tributary streams within the former reservoir bed. Plantings would stabilize exposed sediments and would enhance the process of restoration within the former reservoir bed. Collection of willow cuttings would result in a short-term effect to riparian vegetation in source populations; however, riparian vegetation often rapidly resprouts following trimming (Braatne et al. 1996), so this direct effect from collection would be negligible. Similarly, any collection of wetland plugs for herbaceous vegetation could result in short-term impacts to the source of collection (Hoag 2000).

Considering the availability of these habitats in the Analysis Area, that collections would be short-term and small-scale, and that implementation of the Restoration Plan would re-establish riparian and wetland habitats in the former reservoir bed, any effects to wetland habitats from ground disturbance or collections would be considered negligible.

Indirect Effects – Invasive Weeds

As described above for botanical resources, 13 invasive weed species are known to occur in the Scott Dam Area. Active restoration activities have the potential to introduce new invasive weed populations or spread existing populations. As described for botanical resources above, the potential for the introduction or spread of invasive weeds from active restoration will be addressed and reduced through implementation of the Invasive Weed Restoration Measures and General Restoration Measures. Refer to Section 2.2.3, Table 2-16, for additional details of these measures.

Because invasive weeds have been documented around the entire shoreline of Lake Pillsbury, exposure of soils within the former reservoir bed has the potential to result in passive recolonization by invasive weeds. Within the Elwha River system in Washington, for example, non-native species were often the first colonizers of exposed substrates in the former Lake Aldwell and Lake Mills reservoir beds before weed treatments were implemented (Shafroth et al. 2024). Spread of weeds could, in turn, degrade riparian and wetland habitats. To address and reduce this potential effect, PG&E will implement the Restoration Plan, which will address invasive weeds.

With implementation of the Invasive Weed Restoration Measures, General Restoration Measures, and Restoration Plan, effects to riparian and wetland habitats in the Scott Dam Area from invasive weeds would be considered negligible.

Indirect Effects – Riparian and Wetland Habitats along the Shoreline of Lake Pillsbury

Following the removal of Scott Dam, Lake Pillsbury would no longer impound water, removing a source of water for riparian and wetland habitats along the shoreline under existing conditions. It is likely the riparian and wetland habitats along the tributary-influenced zones would remain unaffected because tributaries would continue to be a water source for the vegetation. However, for any riparian and wetland habitats that are dependent on the reservoir for water, loss of this water source could result in contraction and/or degradation of these habitats.

To address and reduce effects to riparian and wetland habitats that are dependent on reservoir water sources, PG&E would implement the Riparian and Wetland Protection Measures. PG&E will obtain Clean Water Act Section 404/401 permits for the Proposed Action and implement all conditions of the permits, including any riparian protection measures. PG&E would also implement the Restoration Plan to facilitate growth of native riparian and wetland habitats along the Eel River and tributary streams within the former reservoir bed, which would mitigate any short-term losses of reservoir-dependent riparian and wetland habitats. The Restoration Plan will define actions to encourage rapid revegetation of riparian and wetland habitats within the former reservoir bed of Lake Pillsbury and monitoring measures. With implementation of the Restoration Plan, effects to riparian and wetland habitats would be reduced. Refer to Section 2.2 for more details on the goals of the Restoration Plan. Over time, it is expected that the Restoration Plan would result in a greater amount and increased diversity of riparian and wetland vegetation within the former inundation zone along the restored Eel River. Refer to Phase 2b below for a further discussion of the long-term trajectory of riparian and wetland vegetation in the restoration area.

Indirect Effects – Tule Elk Browsing

As described in Section 3.4.1.6, a herd of tule elk is known to occur on the north shore of Lake Pillsbury and has been observed feeding on riparian and wetland vegetation in the tributary-influenced zones and in the emergent wetland habitat on the north shore of Lake Pillsbury. Loss of the reservoir may influence tule elk behavior if forage is significantly affected by the drawdown. Tule elk and other game mammals may be drawn to forage in active restoration areas containing young riparian vegetation and may affect the success of restoration actions, particularly in active planting areas. Several studies have shown that elk and other large herbivores can hinder restoration objectives by preferentially browsing in restored areas, which slows the recovery of riparian vegetation (Averett et al. 2017; Craig 2015; Opperman and Merenlender 2000). To address and reduce this potential effect, PG&E will develop and implement the Tule Elk Management Plan, which would specify monitoring and reporting requirements to document tule elk habitat use during the restoration period and would also specify humane elk exclusion methods to prevent elk browsing from hindering restoration success. Refer to Table 2-16 for additional details of these measures. With implementation of the Tule Elk Management Plan, potential effects to riparian and wetland restoration efforts from tule elk browsing would be negligible.

Phase 2b

Potential effects from Phase 2b include beneficial indirect effects to riparian and wetland habitats from restoration of the former reservoir bed of Lake Pillsbury. Through the implementation of the Restoration Plan (including any required monitoring and adaptive management), restoration of the former reservoir bed of Lake Pillsbury would convert a large area of formerly lacustrine habitats to a mosaic of upland, wetland, and riparian habitats found along the restored channel of the Eel River and tributary streams. Therefore, restoration would likely increase the total area of riparian and wetland vegetation in the long term compared to the existing condition. Also, riparian connectivity would be enhanced between existing riparian and wetland habitats upstream and downstream of Lake Pillsbury.

Therefore, with implementation of the Restoration Plan, facility removal would have a beneficial effect on riparian and wetland habitats in the Scott Dam Area.

Cape Horn Dam Area

The shoreline of Van Arsdale Reservoir contains eight adjacent forested and emergent wetlands (refer to Section 3.3.4, Figure 3.3.4-2).

Potential direct and indirect effects to riparian and wetland habitats following facility removal are provided below and are separated by Phase 2a and Phase 2b.

Phase 2a

Potential direct effects from Phase 2a include disturbance of riparian/wetland habitats during implementation of restoration activities. Potential indirect effects include (1) loss or degradation of habitat from introduction of invasive weeds during restoration and (2) potential changes to riparian and wetland habitats along the shoreline of Van Arsdale Reservoir from sediment release upstream from Cape Horn Dam. Each potential effect is further described in the sections below.

Direct Effects

Most restoration activities will take place within the dewatered reservoir bed of Van Arsdale Reservoir (i.e., on bare substrates). Restoration activities would be conducted in newly exposed areas along the historic river channel that do not support vegetation under existing conditions. Access to restoration areas would utilize construction access roads, as described for construction effects above, and would not require removal of riparian and wetland vegetation for access.

PG&E will implement the Restoration Plan to facilitate the restoration of riparian and wetland habitat within the former reservoir bed. Because the existing reservoir is set within a relatively narrow valley, the restoration area would be relatively small and limited to newly exposed banks of the Eel River. While, as described previously, the Restoration Plan will include collecting and planting native vegetation (e.g., willow plugs), due to the small size of the restoration area, passive revegetation from nearby riparian and wetland vegetation along the banks may reduce the need for any collections. Therefore, it is anticipated that a smaller amount of material at Van Arsdale Reservoir would need to be collected to implement revegetation under the Restoration Plan as compared to Lake Pillsbury restoration areas. Collection of willow cuttings would result in a short-term effect to riparian vegetation in source populations; however, riparian vegetation often rapidly resprouts following trimming (Braatne et al. 1996), so direct effects from collection would be negligible. Similarly, any collection of wetland plugs for herbaceous vegetation could result in minor short-term impacts to the source of collection (Hoag 2000).

Considering the small amount of material and the overall availability of riparian habitats in the Analysis Area, any collections to support the Restoration Plan would result in negligible effects to riparian and wetland habitats in the Cape Horn Dam Area.

Indirect Effects – Invasive Weeds

As described above for botanical resources, eight invasive weed species are known to occur in the Cape Horn Dam Area. Active restoration activities have the potential to introduce new invasive weed populations or spread existing populations. The potential for the introduction or spread of invasive weeds from active restoration will be addressed and reduced through implementation of the Invasive Weed Restoration Measures and General Restoration Measures, as described above. Refer to Section 2.2.3, Table 2-16, for the full language of these measures.

Because invasive weeds have been documented around the shoreline of Van Arsdale Reservoir, exposure of soils within the former reservoir bed have the potential for passive recolonization by invasive weeds. Spread of weeds could, in turn, degrade habitat for special-status plants. To address and reduce this potential effect, PG&E will implement the Restoration Plan, which will include invasive weed monitoring and treatment requirements.

With implementation of the Invasive Weed Restoration Measures, General Restoration Measures, and Restoration Plan, effects to riparian and wetland habitats in the Cape Horn Dam Area from invasive weeds would be considered negligible.

Indirect Effects – Riparian and Wetland Habitats along the Shoreline of Van Arsdale Reservoir

Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels in Van Arsdale Reservoir would be similar to the historical condition (i.e., confined within the historical Eel River channel). Portions of the narrow reservoir bed would be exposed, and the surface and depth to groundwater for shoreline riparian vegetation may increase. The first high-flow event would mobilize coarser sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The nature of the changes will vary depending on the width and slope of any given portion of the reservoir bed. Relatively wide and low-gradient portions of the narrow reservoir bed would be expected to have more sediment deposition than narrower and steeper reaches. While these changes could result in reductions in the current extent of forested and emergent wetlands because of reduced water levels or from burial in sediment, new riparian vegetation may also become established over time on the new depositional surfaces (Shafroth et al. 2002, 2024). A 2024 review of several studies on the Elwha River system noted that new surfaces within the former reservoirs were rapidly colonized, particularly in areas of fine sediment, within 3 to 5 years after dam removal (Shafroth et al. 2024). Additionally, sediments trapped behind Scott Dam upstream may also contain seed sources that could facilitate rapid colonization within Van Arsdale Reservoir, as was observed downstream of the Glines Canyon Dam in the Elwha River system (Shafroth et al. 2024).

Following mobilization of sediments, PG&E will restore the former reservoir bed consistent with the Restoration Plan. The focus of the restoration would be stabilization of the new river channel including native plantings, as necessary. Refer to Section 2.2 for more details on the goals of the Restoration Plan.

With implementation of the Restoration Plan, effects to riparian and wetland habitats in the Cape Horn Dam Area would be negligible. Refer to Phase 2b below for a further discussion of the long-term trajectory of riparian and wetland vegetation in the restoration area.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the construction restoration area and the bed of Van Arsdale Reservoir. Under Phase 2b, restoration of the dam and ancillary facility sites would result in a long-term benefit to riparian and wetland habitats.

Following mobilization of sediments, PG&E will restore the former reservoir bed consistent with the Restoration Plan. The focus of the restoration would be stabilization of the new river channel including native plantings, as necessary. Over time, the reach of the Eel River within Van Arsdale Reservoir is expected to return to a morphologic condition similar to pre-dam conditions. Similar to the patterns observed following dam removal in the Elwha River system (Shafroth et al. 2024), the river is expected to become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. In other areas, the formation of new sediment bars may provide surfaces for the establishment of young riparian vegetation (Shafroth et al. 2002, 2024). The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. While the density of mature riparian vegetation decreased, increased diversity of riparian species and age class structure was observed within 3 to 5 years following dam removal on the Elwha River system (Shafroth et al. 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities.

Therefore, with implementation of the Restoration Plan, facility removal would have a beneficial effect on riparian and wetland habitats in the Cape Horn Dam Area.

Eel River Watershed

The predominant riparian and wetland vegetation along the Eel River downstream of Scott Dam includes black cottonwood, Fremont cottonwood, red alder, riparian mixed hardwood, riparian mixed shrub, wet meadows, white alder, willow, willow (shrub), and willow–alder alliances. Further downstream, riparian and wetland vegetation within the Eel River estuary includes willow, willow (shrub), and pickleweed–cordgrass alliances (refer to Section 3.3.4, Maps 3.3.4-1a–i, for the location of these habitats).

Outside of the Scott Dam and Cape Horn Dam areas, there would be no direct restoration activities in the Eel River Watershed. Potential indirect effects to riparian and wetland habitats following facility removal are provided below and are separated by Phase 2a and Phase 2b.

Phase 2a

As described above, Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximately 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the approximately 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the approximately 119-mi. section from the Middle Fork Eel River to the estuary. Potential effects to riparian and wetland habitats in the Eel River Watershed under Phase 2a are described below.

The sediment release in Phase 2a may indirectly affect riparian and wetland habitats. The duration of erosion of upstream sediment during the initial high-flow event following dam removal is calculated to take from one to eight days depending on the rate of discharge. Based on sediment transport modeling completed for the Proposed Action (refer to Section 3.4.1.8), it is expected that the majority of coarse sediment will be deposited prior to the confluence with the Middle Fork Eel River. In addition, some of the suspended fine sediment may deposit and alter channel or floodplain morphology in this reach, at least temporarily until subsequent high-flow events can resuspend it and transport it farther downstream. Flow from major tributaries downstream will diminish the effect of the elevated sediment load, and it is likely that alterations to the existing channel morphology will become difficult to distinguish downstream of the confluence with the Middle Fork Eel River (located approximately 38 mi. downstream of Van Arsdale Reservoir).

The effects of sediment release on riparian vegetation present along the Eel River would vary based on site-specific factors including volume of discharge, distance from the point of release, and the geomorphology of the site affected. Deposition of sediment closest to the former dam sites could result in temporary burial of vegetation, particularly low-lying shrubs and herbaceous vegetation in close proximity to the river channel. In the Elwha River system, sediment burial did not have measurable effects on the amount of mature riparian vegetation downstream of the removed dams within a 3- to 5-year monitoring period (Shafroth et al. 2024). Effects to riparian vegetation would occur primarily in the reach from Scott Dam downstream to the confluence with the Middle Fork Eel River.

While these changes could result in reduction in the extent of forested and emergent wetlands from burial in sediment, riparian vegetation is generally adapted to periodic disturbances. Riparian areas generally resprout rapidly following sediment deposition (Braatne et al. 1996; Shafroth et al. 2002), and creation of new channel bars and deposits provides surfaces for riparian species to colonize (Rood et al. 2003), particularly early successional species that are not able to compete with mature late-successional riparian species that tend to encroach on regulated channels (Shafroth et al. 2024). Effects from the sediment pulse are anticipated to be greatest in the first year after dam removal, and natural sediment transport dynamics would be restored over time (refer to the Phase 2b discussion below). Therefore, any indirect effects to riparian habitats from sedimentation would be temporary and negligible.

Wetland habitats may also experience temporary burial from sediment deposition (U.S. Bureau of Reclamation 2010). However, because transient sediment deposits would be erodible during subsequent flow events, any effects to existing wetland vegetation would be short term and negligible. Deposition of sediments in new locations may also provide surfaces for the colonization of new wetland vegetation, as was documented in studies of the Elwha River system (Shafroth et al. 2024).

Sediment deposition is expected to decrease with distance and is expected to have a minimal effect downstream of the Middle Fork Eel River to the Eel River estuary and therefore would not result in detectable changes in associated riparian habitats in this reach.

Though sediment deposition is not expected within the Eel River estuary, fine suspended sediment is anticipated to reach the Eel River estuary and would be temporarily suspended in the water column (refer to Section 3.4.1.8 for more information). Because significant deposition is not anticipated, emergent wetland and riparian habitats in the Eel River are unlikely to be significantly affected by fine suspended sediment. However, the Eel River estuary is known to contain submerged aquatic eelgrass habitats (Merkel & Associates, Inc. 2023). Eelgrass can be affected by suspended sediment because fine suspended sediments restrict sunlight penetration, which can reduce photosynthesis and result in reduced growth and survival of eelgrass (Fonseca and Fisher 1986; U.S. Environmental Protection Agency 2003). While the extent of effects is unknown, this effect is expected to be short-term, but it is possible that increased suspended sediment concentrations may adversely affect eelgrass communities in the Eel River estuary.

Phase 2b

From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, and deeper pools. Areas with existing overly dense riparian vegetation may be scoured more frequently or buried in sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two dams were scoured, and new channel bars formed that allowed the establishment of early successional species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024). Restoring the connectivity of the Elwha River also enhanced seed dispersal of hydrochorous plants (i.e., plants that disperse by water) (Shafroth et al. 2024). Therefore, while dam removal may result in local changes in the distribution of riparian vegetation, in the long term, facility removal is expected to benefit the diversity, age class structure, and connectivity of riparian and wetland habitats in the Eel River Watershed as a whole.

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River and is not likely to result in detectable long-term changes in associated riparian and estuarine habitats.

East Branch Russian River

The USFWS NWI identified forested wetlands along the East Branch Russian River (refer to Section 3.3.4.4 for more information), and a review of recent Google Earth Pro imagery (2024) suggests that riparian habitats are present along a series of interconnected canals.

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the approximately 11-mi. stretch of the East Branch Russian River, which flows from the powerhouse, through an alluvial valley (i.e., Potter Valley), and up through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cfs and 225 cfs, with maximum flows of about 300 cfs for the period of record (see Section 3.3.1).

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of natural flows in the East Branch Russian River would result in an intermittent flow regime in the river, and the majority of the river from the powerhouse to the ordinary high water mark of Lake Mendocino (approximately 11 mi.) would be seasonally dry. This would result in an alteration in the location and extent of riparian habitats along the East Branch Russian River. Riparian habitat may be reduced in some areas, but valley oaks and other trees that can tolerate seasonal flows would be expected to persist. Hydrophytic vegetation that requires year-round inundation would be expected to decline.

Therefore, while the extent of alteration is unknown, it is anticipated that a change from a perennial to an intermittent system could result in loss of riparian and wetland habitat. Because many species in California are adapted to intermittent flow regimes, certain riparian species may be able to persist. Nevertheless, the Proposed Action may potentially have a significant adverse effect on riparian vegetation in the East Branch Russian River.

Dam Removal Sequencing Options

Under the Scott Dam removal prior to Cape Horn Dam option, sediment released from Scott Dam would settle into Van Arsdale Reservoir. Prior to Cape Horn Dam removal, this material would be removed and stockpiled within the construction area. As compared to the Proposed Action, this option would result in a longer construction period, a potential increase in turbidity in the construction area, and the potential for spread or introduction of invasive weeds that may become established on stockpiled material. Implementation of this option would result in increased degradation of terrestrial habitats from the spread or introduction of invasive weeds. With implementation of the measures described in Section 2.2.3, Table 2-14, implementation of this option would have a greater effect on botanical resources.

Under the Cape Horn Dam removal prior to Scott Dam option, sediment would be released twice—once following removal of Cape Horn Dam and once following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (refer to Non-Project Use of Project Lands Application). Similar to the previous options, implementation of this option would likely result in a longer disturbance period and increased degradation of terrestrial habitats from the potential spread or introduction of invasive weeds during sediment removal activities, if needed. With implementation of the measures described in Section 2.2.3, Table 2-14, implementation of this option would have a greater effect on botanical resources.

Construction and Environmental Measures

To avoid or reduce effects to botanical resources during construction (Phase 1), PG&E will obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- General Construction Measures
- Special-status Plant Construction Measures
- Invasive Weed Construction Measures
- Riparian and Wetland Protection Measures

To reduce potential effects to botanical resources post-facility removal (Phase 2), PG&E will implement the following environmental measures. A complete list of environmental measures is included in Section 2.2.3.

- General Restoration Measures
- Restoration Plan
- Special-status Plant Restoration Measures
- Invasive Weed Restoration Measures
- Tule Elk Management Plan

Unavoidable Adverse Effects

There are no unavoidable adverse effects to special-status plants from implementation of the Proposed Action.

Unavoidable adverse effects to riparian and wetland resources include the following:

- Potential temporary effects to eelgrass communities in the Eel River estuary from suspended fine sediment load from removal of the dams.
- Potential alteration of riparian and wetland habitat along the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action.

References

Averett, J.P., B.A. Endress, M.M. Rowland, B.J. Naylor, and M.J. Wisdom. 2017. Wild ungulate herbivory suppresses deciduous woody plant establishment following salmonid stream restoration. Forest Ecology and Management 391: 135–144. DOI: 10.1016/j.foreco.2017.02.017.

Braatne, J.H., S.B. Rood, and P.E. Heilman. 1996. Life history, ecology, and conservation of riparian cottonwoods in North America. Pp. 423–458 in R.F. Stettler, H.D. Bradshaw Jr., P.E. Heilman, and T.M. Hinckley, editors. Biology of Populus and Its Implications for Management and Conservation. National Research Council Research Press, Ottawa, Canada.

Craig, A.D. 2015. Impacts of elk management and riparian condition on songbirds in Rocky Mountain National Park. Master's thesis. Colorado State University.

Fonseca, M.S., and J.S. Fisher. 1986. A comparison of canopy friction and sediment movement between four species of seagrass with reference to their ecology and restoration. Marine Ecology Progress Series 29: 15–22.

Google Earth Pro. 2024. 7.3.3.7786. Potter Valley, California. 39.353217, –123.126992. Available at: http://www.google.com/earth/index.html. Accessed November 2024.

Hoag, J.C. 2000. Harvesting, propagating, and planting wetland plants. Riparian/Wetland Project Information Series No. 14. July 2000. U.S. Department of Agriculture, Natural Resources Conservation Service, Plant Materials Center, Aberdeen, ID.

Merkel & Associates, Inc. 2023. Humboldt Bay and Eel River eelgrass monitoring and pilot study project (2020–2023). Prepared for California Sea Grant and NOAA Fisheries. June 2023.

Opperman, J.J., and A.M. Merenlender. 2000. Deer herbivory as an ecological constraint to restoration of degraded riparian corridors. Restoration Ecology 8(1): 41–47. DOI: 10.1046/j.1526-100x.2000.80006.x.

Pacific Gas & Electric Company (PG&E). 2019a. TERR 1 – Botanical resources study data memorialization, technical study summary. Potter Valley Project (FERC Project No. 77 relicensing).

Pacific Gas and Electric Company (PG&E). 2019b. TERR 2 – Wildlife resources study data memorialization, technical study summary. Potter Valley Project (FERC Project No. 77 relicensing).

Rood, S.B., R.A.R. Kalischuk, M.L. Polzin, and J.H. Braatne. 2003. Branch propagation, not cladoptosis, permits dispersive, clonal reproduction of riparian cottonwoods. Forest Ecology and Management 186: 227–242.

Shafroth, P.B., J.M. Friedman, G.T. Auble, M.L. Scott, and J.H. Braatne. 2002. Potential responses of riparian vegetation to dam removal. BioScience 52: 703–712.

Shafroth, P.B., L.G. Perry, J.M. Helfield, J. Chenoweth, and R.L. Brown. 2024. Vegetation responses to large dam removal on the Elwha River, Washington, USA. Frontiers in Ecology and the Environment 12:1272921. doi: 10.3389/fevo.2024.1272921.

U.S. Bureau of Reclamation. 2010. Klamath River sediment sampling program, phase 1 – geologic investigations. September.

U.S. Environmental Protection Agency. 2003. The biological effects of suspended and bedded sediment (SABS) in aquatic systems: a review. Internal report, August 20, 2023.

TABLE OF CONTENTS

List of Acronyms

ac-ft	acre-feet
BCC	Bird of Conservation Concern
BMP	best management practice
CDFW	California Department of Fish and Wildlife
CFP	California Fully Protected
cfs	cubic feet per second
cy	cubic yards
dbh	diameter at breast height
Eagle Act	Bald and Golden Eagle Protection Act
ESA	Endangered Species Act
FD	Federal Delisted
Forest Service	U.S. Department of Agriculture – Forest Service
FSS	Forest Service Sensitive
FT	Federal Threatened
ft.	foot/feet
GIS	geographic information system
mi.	mile(s)
OHWM	ordinary high water mark
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

SE	State Endangered
SSC	California Species of Special Concern
ST	State Threatened
USFS	U.S. Department of Agriculture – Forest Service
USFWS	U.S. Fish and Wildlife Service

3.4.1.6 Wildlife Resources

This section describes the potential effects to wildlife resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Post-facility removal effects are split into phases: Phase 2a – Initial Conditions and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration. Refer to Section 3.4.1.1 for a description of each phase.

The effects are determined by analyzing the changes in wildlife resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1). Analysis of the Proposed Action considers removal of Scott Dam and removal of Cape Horn Dam within the same construction season, as described in Section 2.2. In addition, potential dam removal sequencing options are qualitatively analyzed at the end of the Phase 1 – Short-term Construction Effects section. This includes analysis of the potential effects of (1) removal of Scott Dam prior to the removal of Cape Horn Dam in a year prior to the remove of Cape Horn Dam and (2) removal of Cape Horn Dam in a year prior to the removal of Scott Dam to provide flexibility in dam removal sequencing following completion of engineering design.

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with the implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

This section presents an evaluation of the potential effects of construction activities on wildlife resources, including species listed under the Endangered Species Act (ESA) as well as other special-status wildlife and game species. For this analysis, species have been grouped to include taxonomically similar species, including special-status invertebrates (including monarch butterfly (*Danaus plexippus*) and western bumble bees (*Bombus occidentalis)*), bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis caurina*), other raptors, other special-status birds and game birds, special-status bats, special-status mesocarnivores, and tule elk (*Cervus elaphus nannodes*) and other game mammals. Refer to Section 3.3.5, Table 3.3.5-3, for a list of special-status wildlife species known to occur or potentially occurring in the Analysis Area and their status and habitat requirements. Section 3.3.5, Table 3.3.5-6, provides a list of resident and migratory game species potentially occurring in the Analysis Area. The baseline Analysis Area for short-term construction effects includes the Scott Dam Area and Cape Horn Dam Area, which each include two construction areas:

- The Scott Dam Area construction areas include (1) the Scott Dam and ancillary support facility (necessary for dam removal) construction area and (2) the ancillary facility (not necessary for dam removal) and recreation facility construction area.
- The Cape Horn Dam Area construction areas include (1) the Cape Horn Dam and ancillary support facility (necessary for dam removal) construction area and (2) the ancillary facility (not necessary for dam removal) construction area.

The baseline Analysis Area as defined above varies depending on the biology of wildlife species and is therefore further defined under each section below, where applicable.

The baseline Analysis Area for post-facility removal effects encompasses the larger Eel River and Russian River watersheds and is detailed in the post-facility removal section below.

The following potential effects to wildlife resources resulting from short-term construction-related activities were evaluated:

- Potential effects to special-status invertebrate species:
  - Direct effects to breeding or foraging individuals during construction.
  - Indirect effects through the reduction or degradation of habitat resulting from removal of floral resources or the introduction of invasive weeds during construction.
- Potential effects to bald eagle (Federal Delisted [FD], Bald and Golden Eagle Protection Act [Eagle Act], U.S. Department of Agriculture – Forest Service (Forest Service or USFS) Sensitive [FSS], State Endangered [SE], and California Fully Protected [CFP]):
  - Direct effects to active nests or disturbance of foraging individuals during dam and Project recreation facility/ancillary facility removal and potential helicopter use.
  - Indirect effects through degradation of water quality within aquatic habitats.
- Potential effects to northern spotted owl (Federal Threatened [FT], FSS, State Threatened [ST], and California Species of Special Concern [SSC]):
  - Direct effects to active nests or disturbance of foraging individuals during dam and Project recreation facility/ancillary facility removal and potential helicopter use.
- Potential effects to other raptors:
  - Direct effects to active nests or disturbance of foraging individuals during dam and Project recreation facility/ancillary facility removal and potential helicopter use.
  - Indirect effects through degradation of water quality within aquatic habitats for aquatic-foraging raptors.

- Potential effects to other special-status birds, common birds, and game birds:
  - Direct effects to active nests during trimming or removal of vegetation, dam removal, and Project recreation facility/ancillary facility removal.
  - Indirect effects through the loss or degradation of habitat.
- Potential effects to special-status bat species:
  - Direct effects from potential removal of bat roosts in Project facilities to be removed.
  - Indirect effects through degradation of aquatic foraging habitat during dam and Project recreation facility/ancillary facility removal.
- Potential effects to special-status mesocarnivores:
  - Direct disturbance of individuals during construction activities.
  - Potential vehicle collisions with construction vehicles.
- Potential effects to tule elk or other game mammals:
  - Direct disturbance of individuals during construction activities.
  - Potential vehicle collisions with construction vehicles.

A discussion of potential construction effects to wildlife resources that could occur as a result of implementation of the Proposed Action, with incorporation of construction measures, is provided below by area. In addition, potential effects of the removal of Cape Horn Dam prior to the removal of Scott Dam are also qualitatively analyzed to provide flexibility in decommissioning the Project following completion of engineering design. Unavoidable adverse effects are also discussed at the end of this section.

Potential Effects to Special-status Invertebrates

The Analysis Area for special-status invertebrates includes the Scott Dam and Cape Horn Dam construction areas (see Map 2-8 and Map 2-10 in Section 2.2) as well as potential riparian habitat within the bed and bank of the Eel River immediately downstream of the dams. Provided below is a discussion of potential direct and indirect effects to special-status invertebrates and their habitats, categorized by geographic area.

<u>Scott Dam Area</u>

Both monarch butterflies (*Danaus plexippus*; Federal Candidate) and western bumble bees (*Bombus occidentalis*; FSS, State Candidate Endangered) have the potential to occur in the vicinity of Scott Dam and Lake Pillsbury. Monarch butterflies rely on milkweed (*Asclepias* spp.) as larval host plants, and adults can forage on a wide variety of floral resources in upland and riparian communities. Western bumble bees nest in rodent burrows in the ground and forage on a wide variety of floral resources, typically in open areas. Floral resources located in the proposed construction areas at Scott Dam (including the dam, ancillary facilities, and recreation facilities) may provide foraging habitat for both species. Provided below is a discussion of potential direct effects to special-status invertebrate individuals from construction activities in the Scott Dam Area, as well as indirect effects to habitat.

Direct Effects

The construction areas (work areas, staging areas, and access routes) are primarily located within the footprint of existing facilities that support little vegetation compared to the surrounding landscape. However, some areas may require removal of vegetation. Vegetation that supports breeding and/or floral foraging resources may potentially be present and be affected during the following activities:

- Site access improvements and establishment of work, staging, and stockpile areas required for construction in the Scott Dam Area;
- Temporary improvements to and extension of an existing 0.35-mile (mi.) access road off Scott Dam Road that will provide access to the barge launch at the downstream terminus of the existing plunge pool below the dam; and
- Establishment of construction work, staging, and stockpile areas required for removal of Project recreation facilities and associated access roads.

A search of Calflora (2024) indicates records of milkweed species in the Analysis Area, including two records within 100 feet of Oak Flat Campground and Pogie Point Campground. There is potential for milkweed to be present in areas of proposed site access improvements and the new temporary access road, as well as construction work, staging, and stockpile areas. Similarly, rodent burrows containing suitable nesting sites for western bumble bee may be present in these areas. Considering that most of the construction work areas would be placed within the existing developed footprint of Project ancillary facilities and Project recreation facilities, the area potentially affected is small compared to the availability of breeding habitat on the landscape scale. Vegetation removal and ground disturbance could result in minor, localized direct effects to monarch butterfly and western bumble bee breeding, including disturbance (i.e., flushing or displacement), removal of monarch butterfly larvae, and crushing or burial of burrows containing western bumble bee nests.

To address and reduce potential effects to monarch butterfly and western bumble bee breeding, PG&E will implement General Construction Measures, which restrict ground disturbance to designated areas and require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require any observations of special-status species that were previously undiscovered to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of construction measures to be implemented to address and reduce effects to special-status invertebrates.

Foraging habitat for monarch butterfly and western bumble bee is more general than breeding habitat and consists of flowering plants of a wide variety of species. Therefore, trimming or removal of vegetation to support removal of Scott Dam and Project recreation facilities could potentially result in disturbance (i.e., flushing or displacement) of butterflies and bees if they are foraging in the vicinity. Flushing or displacement of foraging individuals would be short-term and temporary and would cease upon completion of the activity.

With the implementation of construction measures, proposed construction activities in the Scott Dam Area would have negligible and temporary direct effects on special-status invertebrates.

Indirect Effects

As described previously, while the construction areas are primarily located within existing disturbed footprints and do not support abundant floral resources for special-status invertebrates, some trimming and/or removal of vegetation may be required. Removal of vegetation would result in a minor and temporary decrease in potential habitat available for foraging butterflies and a temporary decrease in potential breeding habitat for monarch butterfly if milkweed is removed. Removal of vegetation would also result in a minor and temporary decrease in potential habitat available for foraging western bumble bees. To address and reduce effects of vegetation removal/trimming, PG&E will implement the General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require any observations of special-status species that were previously undiscovered to be reported to PG&E as soon as practicable. In addition, implementation of the Riparian and Wetland Protection Measure, which requires flagging and avoidance of riparian habitat outside of construction work areas, would also protect floral resources. Refer to Section 2.2, Table 2-14, for additional details of construction measures to be implemented to address and reduce effects to special-status invertebrates.

Importation and use of construction vehicles and equipment and foot traffic associated with construction activities, could degrade native plant habitat for special-status invertebrates through the introduction or spread of invasive weeds. To address and reduce the potential for the introduction or spread of invasive weeds, PG&E will implement the Invasive Weed Construction Measure, which requires pre-construction invasive weed surveys; cleaning equipment prior to transport to construction work areas; minimizing soil disturbance to the extent possible; utilizing existing roads; maintaining gravel and spoil piles free of invasive weeds and using weed-free areas for staging and laydown; use of certified weed-free erosion control materials; seeding stockpiles with native seed mixes; cleaning clothing, footwear, and gear before moving from an infested area to a non-infested area; and avoiding working in invasive weed–infested areas or prioritizing activities so that infested areas are worked last. Refer to Section 2.2, Table 2-14, for additional details of construction measures. Implementation of the Invasive Weed Construction Measure will address and reduce the potential for the introduction or spread of invasive weeds that could degrade habitat for special-status invertebrates.

With the implementation of construction measures, proposed construction activities in the Scott Dam Area would have negligible indirect effects on habitat for special-status invertebrates.

Cape Horn Dam Area

Both monarch butterfly and western bumble bee may potentially occur in the Cape Horn Dam Area. Milkweed and rodent burrows, if present, may provide suitable breeding habitat for these species. Floral resources located in the proposed construction areas at Cape Horn Dam may provide foraging habitat for both species. Provided below is a discussion of potential direct effects to special-status invertebrate individuals from construction activities in the Cape Horn Dam Area, as well as indirect effects to habitat.

Direct Effects

The construction areas are primarily located within existing facilities that support little vegetation compared to the surrounding landscape. However, some areas may require removal of vegetation. Vegetation that supports breeding and/or floral foraging resources for special-status invertebrates may potentially be affected during the following activities:

- Site access improvements and establishment of work, staging, and stockpile areas required for construction in the Cape Horn Dam Area; and
- Construction of a new approximate 200-foot (ft.) temporary access road on river-right (looking downstream) from the existing wingwall to an area across river from the diversion intake.

Similar to what is described above, vegetation removal and ground disturbance could result in minor, localized effects to monarch butterfly and western bumble bee breeding, including disturbance (i.e., flushing or displacement) and/or removal of larvae. Considering that most of the construction work areas would be placed within the existing developed footprint of Project ancillary/recreation facilities, the area potentially affected is small compared to the availability of breeding habitat on the landscape scale.

Implementation of the General Construction Measures and General Wildlife Measures will address and reduce the potential for direct effects to special-status invertebrates in the Cape Horn Dam Area. Refer to Section 2.2, Table 2-14, for additional details of construction measures to be implemented to address and reduce direct effects to special-status invertebrates.

With the implementation of construction measures, proposed construction activities in the Cape Horn Dam Area would have negligible and temporary direct effects on special-status invertebrates.

Indirect Effects

As described previously, while construction work, access, staging, and stockpile areas are mostly located within existing disturbed footprints and do not support abundant floral resources for special-status invertebrates, some trimming and/or removal of vegetation will be required. Removal of vegetation would result in a minor and temporary decrease in potential habitat available for foraging butterflies and a temporary decrease in potential breeding habitat for monarch butterflies if milkweed is removed. Removal of vegetation would also result in a minor and temporary decrease in potential habitat available for foraging western bumble bees. To address and reduce effects of vegetation removal/trimming, PG&E will implement General Construction Measures and General Wildlife Measures. In addition, implementation of the Riparian and Wetland Protection Measure would protect floral resources that may be present in riparian areas. Refer to Section 2.2, Table 2-14, for additional details of construction measures to be implemented to address and reduce effects to special-status invertebrates.

Use of construction vehicles and equipment, and foot traffic associated with construction activities, could degrade native plant habitat for special-status invertebrates through the introduction or spread of invasive weeds. As described above, implementation of the Invasive Weed Construction Measure would reduce effects to special-status invertebrate habitat.

Potential Effects to Bald Eagle

Bald eagles in California typically nest in large conifers located within 1 mi. of large bodies of water that provide aquatic foraging habitat (Jackman and Jenkins 2004). Therefore, the Analysis Area for bald eagles includes a 1-mi. buffer around the Scott Dam and Cape Horn Dam construction areas (Map 2-8 and Map 2-9), Lake Pillsbury, and Van Arsdale Reservoir. The Analysis Area also includes the bed and bank of the Eel River 500 feet downstream of the dam construction sites. Provided below is a discussion of potential direct and indirect effects to bald eagle and its habitat, categorized by geographic area.

<u>Scott Dam Area</u>

There are six active bald eagle territories at Lake Pillsbury in the vicinity of the Scott Dam construction areas (refer to Section 3.3.5, Map 3.3.5-2b). Forested habitats within 1 mi. of Lake Pillsbury and ancillary/recreation facilities provide suitable nesting habitat, and Lake Pillsbury and the Eel River below Scott Dam provide suitable foraging habitat. Provided below is a discussion of potential direct effects to bald eagle individuals from construction activities in the Scott Dam Area and indirect effects to habitat.

Direct Effects

The noise from construction equipment, human presence, use of explosives (e.g., for removal of the adit plug), and helicopters could result in disturbance effects to bald eagles nesting or foraging in the Analysis Area. Tree removal may also result in disturbance of bald eagles.

Construction activities at Scott Dam will take place over three seasons: the initial low-flow period (June–October), the first high-flow season (November–May), and the first low-flow season after sediment flushing activities (June–October). These periods partially overlap with the bald eagle nesting period, which occurs between January 1 and August 1 (Jackman and Jenkins 2004). Bald eagles display varying sensitivities to noise depending on the type of activity. While some construction activities (heavy equipment use and human presence) have minor disturbance effects in a localized area, louder activities such as helicopter use or blasting can affect eagles within a wider radius. Construction noise has the potential to cause nest disturbance and/or failure and could result in the abandonment of eggs, nestlings, and/or fledglings.

Blasting may be required during the early breeding season (January/February) to remove the adit plug and flush sediments at Scott Dam. Available information on the response of breeding bald eagles to sonic booms noted that loud noises increased displays of alert behavior (Grubb and King 1991). In many cases, foraging eagles were more easily disturbed than nesting bald eagles, but in some cases, eagles have abandoned their nest following loud noises (Grubb and King 1991). These behaviors varied depending on the distance of the sonic boom recorded from the nest location, with eagles farther away from the sonic boom location showing less disturbance behavior.

The Proposed Action may also require helicopter use during the construction period. Compared to the existing condition in which helicopter use is infrequent, this represents increased potential for disturbance of nesting bald eagles. A literature review completed by Anderson (2007) compares data from various studies on the response of raptors (including eagles, peregrine falcon [*Falco peregrinus anatum*], osprey [*Pandion haliaetus*], and red-tailed hawk [*Buteo jamaicensis*]) to the disturbance and noise of helicopters. In the studies reviewed, helicopters elicited a disturbance response (e.g., flushing from nest) more frequently than fixed-wing aircraft; however, adults were typically flushed from nests only when helicopters approached closely or hovered for long periods of time. A sudden or surprise approach may also elicit a stronger response from adult raptors at nests than a gradual approach (White and Sherrod 1973). Increased helicopter activity has the potential to result in nest abandonment.

The *National Bald Eagle Management Guidelines* (U.S. Fish and Wildlife Service [USFWS] 2007) recommend implementation of the following activity-specific non-disturbance buffers between January 1 and August 1 to avoid impacts to nesting eagles:

- 0.5-mi. no-disturbance buffer for blasting activities;
- 1,000-ft. no-disturbance buffer (horizontal/vertical) for helicopters and fixed-wing aircraft; and
- 660-ft. no-disturbance buffer for use of heavy equipment and general construction activities.

Based on a preliminary evaluation, one existing territory is located within the 0.5-mi. no-disturbance buffer (blasting) from Scott Dam and may therefore potentially be affected by construction activities. PG&E annually monitors active bald eagle nesting activity within the Project area, which provides high quality data on nest locations and nest fidelity over the years. There is potential for active nest locations to change over time, or new nest territories to be established by the time construction activities are implemented in the Scott Dam Area.

To address and reduce disturbance of nesting bald eagles during construction, PG&E will implement a Bald Eagle Conservation Plan (see Section 2.2, Table 2-14 for additional details of the plan). The Bald Eagle Conservation Plan requires the following:

- Tree removal must be restricted to outside the nesting season (i.e., September 1 to December 31). With the implementation of this measure, trees would not be removed during a time of year when eagles are actively scouting trees for potential nest sites (Jackman and Jenkins 2004).

- Pre-construction surveys will be conducted prior to each construction season (i.e., Scott Dam removal and ancillary/recreation facility removal) in the Scott Dam Area. Surveys would be conducted consistent with methods established in PG&E's existing License Article 54 (PG&E 2004).
- Following completion of surveys, PG&E would conduct a geographic information system (GIS) analysis of the location of active nests relative to the timing and location of construction activities (including blasting, helicopter flight paths, and heavy equipment use) and determine whether nests fall within the USFWS-recommended no-disturbance buffers (USFWS 2007). Based on this analysis, the following avoidance and protection measures would apply:
  - If bald eagle nests are found within the no-disturbance buffer of the construction area for Project ancillary facilities (i.e., not necessary for dam removal) and recreation facilities, PG&E would modify the timing of construction activities and/or helicopter flight paths to maintain the no-disturbance buffer to the extent possible. Construction activities would not proceed within this buffer until a qualified biologist determines that the nest is no longer active.
  - If bald eagle nests are found within the no-disturbance buffer of the Scott Dam and ancillary facility (i.e., necessary for dam removal) construction area, PG&E would modify the timing of construction activities and/or helicopter flight paths to the extent possible. However, dam removal must occur during the summer/fall prior to high flows to allow the adit plug removal, sediment flushing to occur during high flows and to address and reduce potential effects to aquatic resources in the Eel River downstream of Scott Dam. Blasting associated with the adit plug removal would be implemented during an appropriate high-flow event (anticipated between December and February). Because these time periods may potentially overlap with the bald eagle nesting season (January 1–August 31), nest disturbance may be unavoidable. Through development of the Bald Eagle Conservation Plan and consultation with USFWS under the Eagle Act, measures to avoid, address, and reduce potential disturbance would be further developed and implemented as part of the Proposed Action to protect bald eagles.

With the implementation of the Bald Eagle Conservation Plan, as well as General Construction Measures and General Wildlife Measures that provide environmental training and inadvertent discovery procedures, adverse direct effects to bald eagle would be reduced. However, the potential for nest disturbance, failure, and/or abandonment remains and would be considered a significant unavoidable adverse effect. PG&E will consult with USFWS to determine the necessity for issuance of take authorization for potentially significant and unavoidable adverse effects to breeding eagles.

With the implementation of the Bald Eagle Conservation Plan, General Construction Measures, and General Wildlife Measures, adverse direct effects to bald eagle would be reduced. However, construction may potentially result in nest disturbance, failure, and/or abandonment if bald eagles are nesting within the no-disturbance buffers of the Scott Dam Area and construction activities cannot be modified to avoid disturbance during the nesting season. Therefore, implementation of the Proposed Action may result in significant adverse effects to bald eagle nesting at Scott Dam.

Indirect Effects

Both nesting habitat and aquatic foraging habitat may be affected by construction activities. A further discussion of each is provided below.

As described previously, nesting habitat is defined to include tall trees within 1 mi. of Project reservoirs and rivers. The proposed construction activities at Scott Dam would result in minimal effects to nesting habitat for bald eagle for several reasons. The construction areas (i.e., work areas, access routes, staging areas, and stockpile areas) are primarily located within the existing disturbed footprint of Project ancillary facilities that do not provide nesting habitat for bald eagle. PG&E may need to improve existing access roads in preparation for construction. Some tree removal may be required along these roads to ensure passage of large construction vehicles and equipment (e.g., barges). Minimal removal of individual trees may also be required to allow for removal of ancillary and recreation facilities. Removal of individual trees immediately adjacent to an existing road or at an existing recreation facility would not significantly alter nesting habitat for bald eagle. In addition, as described in the General Construction Measures, removal of mature, large trees (35 diameter at breast height [dbh] or greater) that have high wildlife value and that represent potential nesting structures for raptors such as bald eagles would be avoided to the extent possible. Therefore, effects to nesting habitat for bald eagle would be negligible.

Bald eagle foraging habitat in the reservoir may also be affected by the drawdown of the reservoir during construction. The construction area at Scott Dam is relatively small and would not disturb bald eagles foraging across the large surface area of Lake Pillsbury. Lake Pillsbury would be drawn down to approximately 10,000 acre-feet (ac-ft) by October of the initial low-flow season. Drawdown of the reservoir would reduce the total surface area of aquatic habitat available for foraging bald eagles. However, research suggests that reservoir drawdowns can benefit eagle foraging by exposing spawning and foraging fish to predation (Jackman et al. 2007), especially in the short term before fish populations have a chance to decline. Therefore, effects to foraging habitat from construction would be negligible.

Use of ground-disturbing construction equipment could result in the degradation of water quality in downstream aquatic habitats from sedimentation or runoff of hazardous materials. Degradation of water quality could, in turn, affect fish that represent prey species for foraging bald eagles. The potential for temporary downstream effects to aquatic foraging habitats will be addressed and reduced through implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, and applicable Forest Service best management practices (BMPs). In addition, PG&E will implement the Riparian and Wetland Protection Measure, that includes (1) obtaining coverage under Clean Water Act Section 404/401 permits and comply with all conditions of the permits and (2) implementing BMPs for work within and near aquatic habitats. Such BMPs may include prohibiting refueling of equipment within 100 ft. of wetlands, streams, or waterways; using secondary containment; providing spill kits onsite; and using appropriate erosion control materials. Refer to Section 2.2, Table 2-14, for additional details of these measures.

With the implementation of these measures, potential effects to bald eagle aquatic foraging habitats during construction would be negligible. Effects following dam removal (including sedimentation in the Eel River) are addressed under Phase 2 – Post-facility Removal Effects.

Therefore, with the implementation of construction measures, proposed construction activities in the Scott Dam Area would have negligible indirect effects on bald eagles.

Cape Horn Dam Area

There is one active bald eagle territory at Van Arsdale Reservoir in the vicinity of the Cape Horn Dam construction areas (refer to Section 3.3.5, Map 3.3.5-2b). Forested habitats surrounding the reservoir provide suitable nesting habitat, and Van Arsdale Reservoir and the Eel River below Cape Horn Dam provide suitable foraging habitat. Provided below is a discussion of potential direct effects to bald eagle individuals from construction activities in the Cape Horn Dam Area, as well as indirect effects to habitat.

Direct Effects

The noise from construction equipment, human presence, and helicopter use could result in disturbance effects to bald eagles nesting or foraging. Tree removal may also result in disturbance to bald eagles.

Construction activities in the Cape Horn Dam Area will take place from March to November, which partially overlaps with the bald eagle nesting season of January 1 and August 1 in California (Jackman and Jenkins 2004). As described above for the Scott Dam Area, construction noise (e.g., including increased helicopter use) has the potential to cause nest disturbance and/or failure and could result in the abandonment of eggs, nestlings, and/or fledglings.

As described above for the Scott Dam Area, to address and reduce disturbance of nesting bald eagles during construction to the extent possible, PG&E will implement a Bald Eagle Conservation Plan. The plan restricts tree removal to outside the nesting season (i.e., September 1–December 31) to avoid effects to eagles scouting trees for potential nest sites. In addition, the Bald Eagle Conservation Plan requires a nest survey each year prior to construction, GIS analysis to determine the location of nests in relation to the location and timing of construction activities (including blasting, helicopter flight paths, and heavy equipment use), and determining whether nests fall within the USFWS-recommended no-disturbance buffers (USFWS 2007). Based on this analysis, the following avoidance and protection measures would apply:

- If bald eagle nests are found within the no-disturbance buffer of the construction area for Project ancillary facilities (not necessary for dam removal), helicopter flight paths and timing of the construction activity would be modified to maintain the no-disturbance buffer. Construction activities would not proceed within this no-disturbance buffer until a qualified biologist has determined that the nest is no longer active.

- If bald eagle nests are found within the no-disturbance buffer of the Cape Horn Dam (or any ancillary facility necessary for dam removal) construction area, PG&E would modify helicopter flight paths and the timing of construction activities to the extent possible. However, the timing of Cape Horn Dam removal has been designed to address and reduce effects to aquatic resources in the Eel River downstream. Because these time periods may overlap with the bald eagle nesting season (January 1–August 31), nest disturbance may be unavoidable. Through development of the Bald Eagle Conservation Plan and consultation with USFWS under the Eagle Act, measures to avoid, address, and reduce potential disturbance would be further developed and implemented as part of the Proposed Action to protect bald eagles.

With the implementation of the Bald Eagle Conservation Plan, as well as General Construction Measures and General Wildlife Measures that provide environmental training and inadvertent discovery procedures, adverse direct effects to bald eagle would be reduced.

However, the potential for nest disturbance, failure, and/or abandonment remains and would be considered a significant unavoidable adverse effect. PG&E will consult with USFWS to determine the necessity for issuance of take authorization for potentially significant and unavoidable adverse effects to breeding eagles. Refer to Section 2.2, Table 2-14, for additional details of the Bald Eagle Conservation Plan.

With the implementation of the Bald Eagle Conservation Plan, General Construction Measures, and General Wildlife Measures, adverse direct effects to bald eagle would be reduced. However, construction may potentially result in nest disturbance, failure, and/or abandonment if bald eagles are nesting within the no-disturbance buffers of the Cape Horn Dam Area and construction activities cannot be modified to avoid disturbance during the nesting season. Therefore, implementation of the Proposed Action may result in significant adverse effects to bald eagle nesting at Cape Horn Dam.

Indirect Effects

As described above, construction activities may result in indirect effects to bald eagle nesting and foraging habitat.

The proposed construction activities at Cape Horn Dam would result in minimal effects to nesting habitat for bald eagle. The construction areas (i.e., work areas, access routes, staging areas, and stockpile areas) are primarily located within the existing disturbed footprint of Project facilities and do not provide nesting habitat for bald eagle. PG&E may need to improve existing access roads in preparation for construction. Some tree removal may be required along these roads to ensure passage of large construction vehicles and equipment (e.g., barges). As described in the General Construction Measures, removal of mature, large trees (35 dbh or greater) that have high wildlife value and that represent potential nesting structures for raptors such as bald eagles would be avoided to the extent possible. Removal of smaller trees immediately adjacent to an existing road would not significantly alter nesting habitat for bald eagle. Therefore, effects to nesting habitat would be negligible.

Construction activities may potentially affect foraging habitat for bald eagle. As part of construction, PG&E would remove or partially remove the fish ladder on the face of Cape Horn Dam. The existing fish ladder at Cape Horn Dam provides an attractant for bald eagle foraging—bald eagles were observed foraging at this facility during studies conducted in 2018 (PG&E 2019a). Construction of temporary cofferdams upstream and downstream to dewater the work area would result in a signification reduction in the size of Van Arsdale Reservoir, which is another foraging location for bald eagle at the Van Arsdale territory. Furthermore, fish rescue would be conducted during dewatering (refer to Section 3.4.1.4, Fish and Aquatic Resources), and stranded fish that represent potential prey would be removed, unlike at Lake Pillsbury. Van Arsdale Reservoir is a narrow reservoir and the presence of construction equipment and personnel would likely deter eagles from foraging in the reservoir. Therefore, construction would result in a significant adverse effect to bald eagle foraging in the Cape Horn Dam Area.

Use of ground-disturbing heavy equipment could degrade water quality in downstream foraging habitats (the Eel River downstream of Cape Horn Dam). To address and reduce these potential effects, PG&E would implement the Bald Eagle Conservation Plan, the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, applicable BMPs, and Riparian and Wetland Protection Measures, as described above under indirect effects to bald eagles in the Scott Dam Area. With the implementation of these measures, potential effects to aquatic foraging habitats from degradation of water quality would be negligible. Effects following dam removal (including sedimentation in the Eel River) are addressed under Phase 2 – Post-facility Removal Effects below.

With the implementation of the Bald Eagle Conservation Plan and other construction measures, potential effects would be reduced, but construction would still likely result in adverse indirect effects to bald eagles in the Cape Horn Dam Area by significantly altering preferred foraging habitat for the Van Arsdale bald eagle territory.

Potential Effects to Northern Spotted Owl

The Analysis Area for northern spotted owl is defined as a 1-mi. buffer from the boundaries of the Scott Dam and Cape Horn Dam construction areas (Map 2-8 and Map 2-10). This Analysis Area encompasses the largest buffer imposed by USFWS for the minimization of disturbance effects to northern spotted owl. Provided below is a discussion of potential direct and indirect effects to northern spotted owl and its habitat, categorized by geographic area.

Scott Dam Area

The Scott Dam construction areas are within 1 mi. of USFWS-designated Critical Habitat for the northern spotted owl (USFWS 2012), and historical records indicate multiple historical occurrences of northern spotted owl in this region (USFS 2024; CNDDB 2024). There are two known northern spotted owl pairs that have been observed within 2 mi. of Scott Dam since the fires in 2018 (USFS 2024), and there are multiple USFS-designated activity centers within 1 mi. of Scott Dam (USFS 2024). There are also Critical Habitat and USFS-designated activity centers within 1 mi. of the Eel River Visitor Information Kiosk (a recreation facility that will be removed as part of the Proposed Action). There are no USFS-designated activity centers within 1 mi. of the recreation facility construction areas surrounding Lake Pillsbury.

Suitable habitat for northern spotted owl was mapped as part of studies completed in 2018 (PG&E 2019a). There is no suitable habitat within the Scott Dam construction area footprint, but PG&E has mapped suitable habitat for northern spotted owl within 0.5 mi. of Scott Dam and associated recreation facilities adjacent to Lake Pillsbury (PG&E 2019a). Therefore, northern spotted owls may potentially forage and nest within the Analysis Area.

Provided below is a discussion of potential direct effects to northern spotted owl individuals from construction activities in the Scott Dam Area, as well as indirect effects to habitat.

Direct Effects

The noise from construction equipment, human presence, use of explosives for removal of the adit plug, and helicopter use could result in disturbance effects to northern spotted owls nesting or foraging in the Analysis Area. Tree removal could also potentially directly affect northern spotted owls.

As described above, construction activities at Scott Dam will take place over three main periods: the initial low-flow period (June–October), the first high-flow season (November–May), and the first low-flow season after sediment flushing activities (June–October). These periods partially overlap with the USFWS-designated limited operating period for northern spotted owl (USFWS 2006), which is from February 1 to July 9 in California. Northern spotted owls display varying sensitivities to noise depending on the type of activity; while some construction activities (heavy equipment use and human presence) have minor disturbance effects in a localized area, noisier activities such as helicopter use or blasting can affect northern spotted owls within a much wider radius (USFWS 2006). Construction noise (including noise along the helicopter flight paths) has the potential to cause nest disturbance and/or failure and could result in the abandonment of eggs, nestlings, and/or fledglings.

The Proposed Action may require helicopter use during the construction period. Compared to the existing condition in which helicopter use is infrequent, this represents increased potential for disturbance along the helicopter route. In addition to the activity center near Scott Dam, other northern spotted owl activity centers along the helicopter route may also be affected by the helicopter noise.

During the daytime when construction activities would take place, owls are typically resting in roost locations or tending the nest. Adult owls roost in proximity to the nest (particularly the females), and egg and nestling survival depends on their behavior (Swarthout and Steidl 2003). Spotted owls typically roost in cool, moist microclimates, and flushing caused by loud noises could expose them to heat stress and increase their energy intake (Swarthout and Steidl 2003). Spotted owls are also more vulnerable to predation (particularly fledgling birds), and flushing may cause increased mortality (Forsman et al. 1984; Verner et al. 1992). Studies measuring stress hormone levels in spotted owls have found that use of machinery and heavy construction activity associated with timber harvest activities raise their physiological stress response (Tempel and Gutiérrez 2004;

Wasser et al. 1997). Other studies have shown that northern spotted owls in proximity to noisy roads fledge fewer young than those near less trafficked roads (Hayward et al. 2011).

USFWS (2006) recommends implementing the following activity-specific no-disturbance buffers between February 1 and July 9 to avoid impacts to northern spotted owl nests:

- 1-mi. no-disturbance buffer for blasting activities;
- 0.5-mi. no-disturbance buffer (horizontal/vertical) for helicopters; and
- 0.25-mi. no-disturbance buffer for hauling on open roads, use of heavy equipment, rock crushing, and use of fixed-wing aircraft.

Based on a preliminary evaluation, there are three USFS-designated activity centers that are located within a 1-mi. buffer (blasting) from Scott Dam, and nests may therefore potentially be affected by construction activities. Active nest locations may change over time, and new activity centers may be designated by the time construction activities are implemented in the Scott Dam Area.

To address and reduce disruption of nesting northern spotted owls during construction to the extent possible, PG&E will implement the Northern Spotted Owl Management Plan. The details of the plan are provided in Section 2.2, Table 2-14. The Northern Spotted Owl Management Plan will require PG&E to consult with USFWS and the Mendocino National Forest to obtain the most recent information on suitable habitat and/or nests within 1 mi. of the construction areas. If recent nest survey information is unavailable, PG&E will conduct one year of protocol-level nest surveys in potentially affected activity centers in the Scott Dam Area the year prior to construction activities.

Following completion of nest surveys, PG&E would conduct a GIS analysis of the location of active nests relative to the timing and location of construction activities (including blasting, helicopter flight paths, and heavy equipment use) and determine whether nests fall within the USFWS-recommended no-disturbance buffers (USFWS 2006). Based on this analysis, the following avoidance and protection measures would apply:

- If northern spotted owl nests are found within the no-disturbance buffer of the construction area for Project ancillary facilities (i.e., not necessary for dam removal) and recreation facilities, PG&E would modify the timing of construction activities and/or helicopter flight paths in order to maintain the no-disturbance buffer to the extent possible.
- If northern spotted owl nests are found within the no-disturbance buffer of the Scott Dam and ancillary facility (necessary for dam removal) construction area, PG&E would modify the timing of construction activities and/or helicopter flight paths to the extent possible. However, dam removal must occur during the summer/fall prior to high flows to allow the adit plug removal and flushing of sediments to occur during high flows and address and reduce potential effects to aquatic resources in the Eel River downstream of Scott Dam. Blasting associated with the adit plug removal would be implemented during an appropriate high-flow event (anticipated between December and February). Because these time periods may potentially overlap with the northern spotted owl nesting season (February 1–July 9), nest disturbance may be unavoidable. Through development of the

Northern Spotted Owl Management Plan and consultation with USFWS under the ESA, measures to avoid and address and reduce potential disturbance would be further developed and implemented as part of the Proposed Action.

With the implementation of the Northern Spotted Owl Management Plan, as well as General Construction Measures and General Wildlife Measures that provide environmental training and inadvertent discovery procedures, adverse direct effects to northern spotted owl would be reduced. However, the potential for nest disturbance, failure, and/or abandonment (particularly as a result of blasting) remains and would be considered a significant unavoidable adverse effect. PG&E will consult with USFWS to determine the necessity for issuance of take authorization for potentially significant and unavoidable adverse effects to northern spotted owls.

Construction may also affect owls foraging or roosting in the area and may result in displacement of adult individuals. However, given that construction will occur in small, localized areas and will be heaviest at Scott Dam, northern spotted owls may be able to shift their foraging patterns, in the short term, to areas with less noise disturbance. Furthermore, non-breeding owls are generally less sensitive to noise disturbance than nesting owls (USFWS 2006). Therefore, any effects to foraging northern spotted owl from construction would be negligible.

With the implementation of the Northern Spotted Owl Management Plan, General Construction Measures, and General Wildlife Measures, potential effects from construction would be reduced. However, construction may potentially result in nest disturbance, failure, and/or abandonment if northern spotted owls are nesting within the no-disturbance buffers of the Scott Dam Area and construction activities cannot be modified to avoid disturbance during the nesting season. Therefore, construction activities may result in significant adverse effects to northern spotted owl at Scott Dam.

Indirect Effects

The proposed construction activities at Scott Dam would result in minimal effects to habitat for northern spotted owl for several reasons. The construction areas (i.e., work areas, access routes, staging areas, and stockpile areas) will be mostly located within the existing disturbed footprint of Project ancillary/recreation facilities that do not represent habitat for northern spotted owl.

PG&E may need to improve existing access roads in preparation for construction. Some tree removal may be required along these roads to ensure passage of large construction vehicles and equipment (e.g., barges). Minimal removal of individual trees may also be required to allow for removal of ancillary and recreation facilities. Removal of trees immediately adjacent to existing roads and within recreation facilities would not result in significant alteration of nesting or foraging habitat for northern spotted owl. In addition, as described in the General Construction Measures, removal of mature, large trees (35 dbh or greater) that have high wildlife value would be avoided to the extent possible. Therefore, any potential effects to nesting or foraging habitat from construction would be negligible.

With the implementation of construction measures, proposed construction activities in the Scott Dam Area would have negligible indirect effects on northern spotted owl habitat.

Cape Horn Dam Area

There is no USFWS-designated Critical Habitat or designated activity centers within 1 mi. of the Cape Horn Dam construction areas (USFWS 2012). There are also no known observations of northern spotted owl in the construction areas (CNDDB 2024). While some suitable habitat was mapped as part of studies in 2018 (PG&E 2019a), habitat in this location is patchy and is therefore unlikely to support nesting (refer to Section 3.3.5, Maps 3.3.5-3a–i).

There are Critical Habitat and USFS-designated activity centers within 1 mi. of Trout Creek Campground (USFWS 2012). Trout Creek Campground and loop road would not be removed; and would be transferred to a third party.

Provided below is a discussion of potential direct and indirect effects to northern spotted owl in the Cape Horn Dam Area.

Direct Effects

Because there is no Critical Habitat or designated activity centers in the analysis area for Cape Horn Dam; there are no known observations; and habitat is patchy and unlikely to support nesting, direct effects to northern spotted owl from construction activities in the Cape Horn Dam Area would be negligible.

No ground-disturbing construction activities would take place as part of the transfer of the Trout Creek Campground roads; therefore, there would be no direct effects to northern spotted owl near Trout Creek Campground.

Indirect Effects

The proposed construction activities at Cape Horn Dam would result in minimal effects to habitat for northern spotted owl for several reasons. There is no suitable breeding habitat for northern spotted owl; therefore, construction would not affect breeding habitat. The construction areas (i.e., work areas, access routes, staging areas, and stockpile areas) will be mostly located within the existing disturbed footprint of Project ancillary/recreation facilities that do not represent foraging habitat for northern spotted owl. PG&E may need to improve existing access roads in preparation for construction. Some tree removal may be required along these roads to ensure passage of large construction vehicles and equipment (e.g., barges). Removal of trees immediately adjacent to existing roads would not result in significant alteration of foraging habitat for northern spotted owl. Therefore, any potential effects to foraging habitat from construction would be negligible.

With the implementation of construction measures, proposed construction activities in the Cape Horn Dam Area would have negligible indirect effects on northern spotted owl habitat.

Potential Effects to Other Raptors

Raptor species that are known to occur in the vicinity of the Scott Dam Area and Cape Horn Dam Area construction areas include northern (American) goshawk (*Accipiter gentilis* [*A. atricapillus*]) (FSS, SSC), American peregrine falcon (FD, State Delisted, CFP), and osprey. Raptor species for which suitable habitat is present and the species may potentially occur include the golden eagle (*Aquila chrysaetos*) (Eagle Act, CFP), short-eared owl (*Asio flammeus*) (Bird of Conservation Concern [BCC], SSC), long-eared owl (*Asio otus*) (BCC, SSC), and northern harrier (*Circus hudsonius*) (BCC, SSC). Common raptor species (e.g., red-tailed hawk, red-shouldered hawk [*Buteo lineatus*], and Cooper's hawk [*Accipiter cooperii*]) are also known to nest and forage in the Project vicinity.

The Analysis Area for other raptors is defined as a 1-mi. buffer from the boundaries of the Scott Dam and Cape Horn Dam construction areas (see Map 2-8 and Map 2-10 in Section 2.2), Lake Pillsbury, and Van Arsdale Reservoir. The Analysis Area was selected for consistency with the Analysis Area established for bald eagle and northern spotted owl, as described above.

Provided below is a discussion of potential direct and indirect effects to other raptors and their habitat, categorized by geographic area.

<u>Scott Dam Area</u>

Northern (American) goshawk is known to occur in forested habitats surrounding Lake Pillsbury. Historical records indicate there are multiple observations within 1 mi. of the Project boundary, though none of these observations were nesting records (USFS 2016). American peregrine falcon and osprey have also been recorded in the vicinity of Project recreation facilities at Lake Pillsbury (PG&E 2019a). Other special-status raptors that may potentially occur in the Scott Dam Area include the short-eared owl, long-eared owl and northern harrier.

Provided below is a discussion of potential direct effects to raptor individuals from construction activities in the Scott Dam Area, as well as indirect effects to habitat.

Direct Effects

Noise from construction equipment, human presence, helicopter use, and blasting activities could result in disturbance effects to raptors foraging or nesting in the Analysis Area. Tree removal could also directly affect raptors. Construction activities at Scott Dam will take place over three main periods: the initial low-flow period (June–October), the first high-flow season (November–May), and the first low-flow season after sediment flushing activities (June–October). These periods partially overlap with the breeding season for special-status raptors that are known to occur in the Scott Dam Area, which is typically between February 15 and August 15 for northern (American) goshawk, February 15 and July 31 for American peregrine falcon, and March 15 and August 31 for osprey.

As discussed above, the Proposed Action may require helicopter use during the construction period. Compared to the existing condition in which helicopter use is infrequent, this represents increased potential for disturbance along the helicopter route. A literature review completed by Anderson (2007) compares data from various studies on the response of raptors (including eagles, peregrine falcon, osprey, and red-tailed hawk) to disturbance and noise from helicopters. In the studies reviewed, helicopters elicited a disturbance response (e.g., flushing from nest) more frequently than fixed-wing aircraft; however, adults were typically flushed from nests only when helicopters approached closely or hovered for longer periods of time. A sudden or surprise approach may elicit a stronger response from adult raptors at nests than a gradual approach (White and Sherrod 1973).

Blasting may be required during the early breeding season (February) to remove the adit plug and flush sediments at Scott Dam. Available information on the response of raptors to loud noises such as sonic booms is limited, but a study on prairie falcons from a hydroelectric dam construction project in Idaho found that perched falcons flushed in response to blasts but that the majority of incubating falcons often showed no response. Nest-flushing behaviors varied depending on the individual, with some individuals taking short flushing flights and at least one taking a long flight away from the nest before returning (Holthuijzen et al. 1990). Falcons may be more tolerant once eggs have been laid, but blasting early in the nesting season could discourage breeding in a localized area (Holthuijzen et al. 1990).

A further discussion of potential direct construction effects specific to each species or group of species is provided below.

Northern (American) Goshawk, Golden Eagle, and Other Raptors

Construction areas (work areas, access routes, staging areas, and stockpile areas) are primarily located within the existing disturbed footprint of Project ancillary/recreation facilities. These areas have more open canopy cover conditions than the closed forest canopy conditions preferred by northern (American) goshawk. Also, northern (American) goshawks and golden eagles are very sensitive to human noise and disturbance from recreation (Morrison et al. 2011; Spaul and Heath 2017) and are therefore unlikely to nest in the immediate vicinity of Project recreation facilities or dams under existing conditions in which human presence is high during the summer recreation season. While some vegetation removal immediately surrounding the existing facility footprint may be required for construction access, goshawks are very unlikely to nest in the trees surrounding recreation facilities. There are no known active goshawk nests within a 0.25-mi. radius of the Scott Dam construction areas or Project recreation/ancillary facilities. Common raptors such as red-tailed hawks may nest in these areas, and noise disturbance and tree removal during construction could result in nest abandonment.

To reduce the potential for effects to active northern goshawk, golden eagle, or other raptor nests, PG&E will implement the Other Raptors Measure (under the Other Raptor Construction Measures), which requires that tree removal be implemented outside the nesting season (i.e., September 1–December 31) to the extent possible. This would address and reduce the potential for disturbance of nesting raptors other than northern goshawk and golden eagle, which are unlikely to nest in the construction areas.

The Other Raptors Measure also requires a pre-construction raptor survey to be conducted within 500 ft. of all work areas in the year prior to initiation of each construction season. Following completion of surveys, PG&E would conduct a GIS analysis of the location of active nests relative to the timing and location of construction activities (including blasting, helicopter flight paths, and heavy equipment use) and determine whether nests fall within the species-specific protective buffers established in PG&E's existing Avian Protection Plan and/or agency regulations and policies. Based on this analysis, the following avoidance and protection measures would apply:

- If nests are found within the no-disturbance buffer of the construction area for Project ancillary facilities (i.e., not necessary for dam removal) and recreation facilities, PG&E would modify the timing of construction activities and/or helicopter flight paths to maintain the no-disturbance buffer to the extent possible. Construction activities would not proceed within this buffer until a qualified biologist determines that the nest is no longer active.
- If nests are found within the no-disturbance buffer of the Scott Dam and ancillary facility (i.e., necessary for dam removal) construction area, PG&E would modify the timing of construction activities and/or helicopter flight paths to the extent possible. If the timing or location of activities cannot be modified, PG&E would consult with resource agencies to determine if a site-specific buffer may be established to protect the nest considering site topography, natural barriers, and the nature of the construction activity.

Because dam removal must occur during the summer/fall prior to high flows to allow the adit plug removal and flushing of sediments to occur during high flows and address and reduce potential effects to aquatic resources in the Eel River downstream of Scott Dam, it may be determined that a site-specific buffer cannot be established to protect the nest during dam and ancillary facility (necessary for dam removal) removal. With the implementation of the Other Raptor Construction Measures, as well as General Construction Measures and General Wildlife Measures that provide environmental training and inadvertent discovery procedures, adverse direct effects to raptors would be reduced. However, the potential for nest disturbance, failure, and/or abandonment remains and would be a significant unavoidable adverse effect. Refer to Section 2.2, Table 2-14, for additional details of these construction measures.

Foraging goshawks, golden eagles, or other common raptors could also be flushed or disturbed by the noise of construction. Any effects from noise would be short-term and temporary and would cease after construction. Therefore, effects to foraging northern goshawk, golden eagle, and other common raptors would be temporary and negligible.

With the implementation of construction measures, effects to northern (American) goshawk, golden eagle, and other common raptors from construction activities in the Scott Dam Area would be reduced. However, construction may potentially result in nest disturbance, failure, and/or abandonment if raptors are nesting within the no-disturbance buffers of the Scott Dam Area and construction activities cannot be modified to avoid disturbance during the nesting season. Therefore, implementation of the Proposed Action may result in significant adverse effects to raptors nesting at Scott Dam.

American Peregrine Falcon

American peregrine falcons typically nest on cliffs or human structures that mimic cliff habitat. A pair of peregrine falcons was observed in the vicinity of Sunset Campground in 2018 (PG&E 2019a). As required by the American Peregrine Falcon Measure (under the Other Raptor Construction Measures), the year prior to construction and in each subsequent construction period, PG&E will survey the dams and any other cliff-nesting habitat present within 500 ft. of construction areas to determine whether nests are present that would unavoidably be affected by proposed blasting and dam removal. In the unlikely event an American peregrine falcon nest is located within 500 ft. of the Scott Dam construction areas or is nesting on the dam or ancillary facilities (necessary for dam removal), PG&E will install nest exclusion devices outside the peregrine falcon nesting season (i.e., August 1–February 14) and prior to the Initial Low-Flow Season – Year 1 construction activities to prevent initiation of nesting in the year of construction.

For construction at recreation facilities and ancillary facilities (not necessary for dam removal), if an active American peregrine falcon nest is identified within 500 ft. of the construction areas, PG&E will establish a 500-ft. protective no-disturbance buffer that will be maintained until a qualified biologist determines that the nest is no longer active, consistent with PG&E's existing Avian Protection Plan. To further protect American peregrine falcon, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures.

Foraging American peregrine falcon could also be flushed or disturbed by the noise of construction. Any effects from noise would be short-term and temporary and would cease after construction.

Therefore, with the implementation of construction measures, direct effects to American peregrine falcon nests from construction activities in the Scott Dam Area would be negligible.

Osprey

Ospreys typically nest on large trees but can also nest on human structures (i.e., power poles and transmission towers) that mimic tree habitat. Ospreys were observed at Lake Pillsbury in 2018 (PG&E 2019a). There is some potential that osprey nests could be established near construction areas or on Project powerline/communication line poles that would be removed as part of the Proposed Action. Therefore, construction activities could potentially result in direct removal of a nest or abandonment of the nest as a result of construction activities.

To address and reduce the potential impact to nesting ospreys from construction activities, PG&E will implement the Osprey Measure (under the Other Raptor Construction Measures), which requires that osprey surveys be conducted concurrently with bald eagle surveys (as described above) in the year prior to construction and prior to each subsequent construction period. The Osprey Measure also contains requirements to protect nests at Scott Dam and during recreation and ancillary facility removal, as well as during removal of Project powerlines/communication lines; a discussion of each is provided below.

To prevent effects to osprey nesting in the vicinity of the Scott Dam construction areas, tree removal would be conducted between September 1 and December 31, outside the nesting season. If an osprey nest is identified on a PG&E facility, PG&E will remove the nest prior to the nesting season (i.e., September 1–March 14) to encourage nesting outside of the construction areas. In the unlikely event a new nest is established within 300 ft. of the Scott Dam construction areas during the construction period, PG&E will develop site-specific no-disturbance buffers to be maintained until a qualified biologist has determined that the nest is no longer active, consistent with PG&E's existing Avian Protection Plan. Compared to other species, ospreys are more tolerant of human disturbances and will place their nests in areas with recreation activity or heavy traffic (Harmata et al. 2007). Because of this tolerance, if a nest is located within 300 ft. of Scott Dam, a qualified biologist with stop-work authority will be onsite when construction commences to monitor the behavior of ospreys and to determine the level of monitoring that would be needed during the construction period. With the implementation of the Osprey Measure, construction effects at Scott Dam would be negligible.

To the extent possible, recreation facilities and ancillary facilities would be removed outside the nesting season (i.e., September 1–December 31). If construction must occur during the nesting season and an active osprey nest is located within 300 ft. of the removal area, the Osprey Measure establishes a no-disturbance buffer during the nesting season (March 15–August 31), consistent with the PG&E's existing Avian Protection Plan. The no-disturbance buffer would be maintained until a qualified biologist has determined that the nest is no longer active. If it is determined that the buffer cannot be maintained, an alternate site-specific buffer that considers site topography, natural barriers, and the nature of the construction activity will be developed and implemented as part of the Proposed Action. With the implementation of the Osprey Measure, construction effects at Project ancillary and recreation facilities would be negligible.

All Project powerlines will be removed as part of decommissioning. If an active osprey nest is identified on Project powerline or communication line poles, the pole will remain in place until the nest is no longer active, as determined by a qualified biologist. If work must be conducted in a subsequent year, PG&E will remove the pole and the nest outside the osprey nesting season (i.e., September 1–March 14). With the implementation of the Osprey Measure, construction effects from powerline/communication line removal would be negligible.

To further protect osprey, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures.

With the implementation of construction measures, potential direct effects to osprey from removal of nests or noise disturbance during construction would be negligible.

Indirect Effects

Potential indirect effects to raptors in the Scott Dam Area include potential effects to forest nesting habitat and to aquatic foraging habitat (e.g., for osprey and American peregrine falcon). Cliff nesting habitat for American peregrine falcon and golden eagle would not be affected by construction activities.

The proposed construction activities at Scott Dam would result in minimal effects to nesting habitat for raptors because the construction areas (work areas, access routes, staging areas, and stockpile areas) are primarily located within the existing disturbed footprint of Project ancillary/recreation facilities. However, some tree removal may be required along existing roads to ensure passage of large construction vehicles and equipment (e.g., barges). Minimal removal of individual trees may also be required to allow for removal of ancillary and recreation facilities. Removal of trees immediately adjacent to existing roads and within recreation facilities would not significantly alter nesting habitat for raptors. In addition, as described in the General Construction Measures, removal of mature, large trees (35 dbh or greater) that have high wildlife value and may be used as perches, roosts, or nesting structures would be avoided to the extent possible. Therefore, any potential effects to nesting habitat from construction would be negligible.

Tree removal may also be required for the temporary extension of an existing road off Scott Dam Road to provide access to a temporary barge launch at the downstream terminus of the existing plunge pool below the dam. Removal of trees associated with construction activities could reduce the availability of nesting habitat for raptors, although these localized areas are relatively small compared to the availability of potential nesting trees in the Analysis Area. Therefore, any potential effects to nesting habitat from construction would be negligible.

Foraging habitat for aquatic-foraging raptors (e.g., osprey and American peregrine falcon) may be affected by the drawdown and by potential sedimentation or runoff of hazardous materials associated with construction that could affect water quality in Lake Pillsbury, the Eel River downstream of Scott Dam, and associated wetland and riparian habitats. As described in detail above for bald eagle, the potential for effects to aquatic foraging habitats would be addressed and reduced by the drawdown requirements specified in Section 2.2 and the implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, applicable Forest Service BMPs, and Riparian and Wetland Protection Measures. With the implementation of these measures, proposed construction activities in the Scott Dam Area would have negligible indirect temporary effects on aquatic foraging habitat for raptors. Effects following dam removal (including sedimentation in the Eel River) are addressed under Phase 2 – Post-facility Removal Effects.

With the implementation of construction measures, proposed construction activities in the Scott Dam Area would have negligible indirect effects on other raptors.

Cape Horn Dam Area

Ospreys are known to occur in the Cape Horn Dam Area, and suitable habitat is also present for northern (American) goshawk, golden eagle, American peregrine falcon, short-eared owl, long-eared owl, northern harrier, and other common raptor species. American peregrine falcon may potentially forage in the Cape Horn Dam area, but the analysis area lacks suitable cliff structures for nesting. A discussion of potential direct effects and indirect effects is provided below.

Direct Effects

As described above, construction activities (including helicopter use) have the potential to directly disturb nesting and foraging raptors. To address and reduce these potential effects, PG&E will implement the Other Raptor Protection Measure and Osprey Measure, which require tree removal outside the nesting season to the extent possible, pre-construction nest surveys in the year prior to construction, GIS analysis to determine nest locations in relation to construction activities, and either the implementation of nest removal outside the nesting season or the implementation of no-disturbance nest buffers (to the extent possible). Construction also has the potential to directly remove/disturb nests if any are placed on PG&E structures. If necessary, exclusion of peregrine falcon nests and removal of osprey nests on PG&E structures may also be implemented. Refer to the discussion above for the Scott Dam Area for a full description of these measures.

To further protect other raptors, PG&E will implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. Implementation of construction measures would reduce the adverse direct effects to raptors. However, because dam removal must occur during the summer/fall prior to high flows to allow the flushing of sediments to occur during high flows and address and reduce potential effects to aquatic resources in the Eel River downstream of Cape Horn Dam, it may be determined that a site-specific buffer cannot be established to protect nests during dam and ancillary facility (necessary for dam removal) removal. Nest disturbance, failure, and/or abandonment may occur during dam removal and would be a significant unavoidable adverse effect.

Foraging raptors could also be flushed or disturbed by the noise of construction. Any effects from noise would be short-term and temporary and would cease after construction. Therefore, effects to foraging raptors would be temporary and negligible.

Indirect Effects

As described above, construction activities also have the potential to indirectly affect nesting and aquatic foraging habitat for raptors. To address and reduce these potential effects, PG&E will implement the General Construction Measures to address and reduce removal of large trees (35 dbh or greater) that have high wildlife value and represent potential nesting structures for raptors. PG&E will also implement the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, applicable BMPs, and Riparian and Wetland Protection Measures to protect water quality in aquatic foraging habitats. With the implementation of these measures, proposed construction activities in the Cape Horn Dam Area would have negligible indirect effects on nesting and aquatic foraging habitat for raptors.

Potential Effects to Other Special-status Birds, Common Birds, and Game Birds

In addition to raptors, the Project vicinity contains suitable habitat for a variety of special-status birds and other common bird species, including game birds. Refer to Section 3.3.5, Table 3.3.5-3, for a list of special-status birds and Table 3.3.5-6 for a list of game birds that are known to or may potentially occur in the Scott Dam and Cape Horn Dam areas.

The Analysis Area for other special-status birds or game birds is defined as a 300-ft. buffer from the boundaries of the Scott Dam and Cape Horn Dam construction areas (Map 2-8 and Map 2-10), Lake Pillsbury, and Van Arsdale Reservoir. The Analysis Area also includes riparian habitats along the Eel River downstream of the dams.

Provided below is a discussion of potential direct and indirect effects to other special-status birds or game birds and their habitat, categorized by geographic area.

Scott Dam Area

In the Scott Dam Area, yellow warbler (*Setophaga petechia*) (SSC) is known to occur near the Pillsbury Pines Day Use Area. The Scott Dam Area also contains suitable habitat for tricolored blackbird (*Agelaius tricolor*) (BCC, ST, SSC), grasshopper sparrow (*Ammodramus savannarum*) (SSC), olive-sided flycatcher (*Contopus cooperi*) (BCC, SSC), least bittern (*Ixobrychus exilis*) (SSC), loggerhead shrike (*Lanius ludovicianus*) (SSC), purple martin (*Progne subis*) (SSC), and bank swallow (*Riparia riparia*) (ST).

Provided below is a discussion of potential direct and indirect effects to other special-status birds or game birds that are known to or may potentially occur in the Analysis Area.

Direct Effects

Nesting songbirds could be directly disturbed, and/or their nests removed, by construction activities that include removal of structures (i.e., Scott Dam, ancillary facilities, and recreation facilities) and/or the removal of any vegetation required for construction. Potential effects to nesting birds from removal of structures and removal of vegetation are described further below.

Some common bird species observed in the Analysis Area such as black phoebe (*Sayornis nigricans*) and swallows (*Hirundinidae* spp.) may build nests directly on structures and buildings to be removed as part of the Proposed Action. These species typically use the same nest for multiple years. Removal of the structures during the nesting season could result in loss of active nests bearing eggs or chicks. As described above for bald eagle and other raptors, Scott Dam removal activities will require overlap with the general nesting bird season to allow the adit plug removal and flushing of sediments to occur during high flows and address and reduce potential effects to aquatic resources in the Eel River downstream of Scott Dam.

To address and reduce the potential for active nests to be removed during construction at the dam, PG&E will implement the Other Special-status Birds and Game Birds Construction Measures, which require a qualified biologist to survey for existing nests at Scott Dam the year prior to construction. If nests are found, they will be removed outside the nesting season (September 1–

February 14) and if nests are established on the dam or other PG&E facilities to be removed, exclusion devices will be installed to prevent new nest construction.

To address and reduce the potential for active nests to be removed during construction at Project ancillary and recreation facilities, the Other Special-status Birds and Game Birds Construction Measures require PG&E to conduct facility removal outside the nesting season to the extent possible. If facility removal outside the nesting season is not possible, a qualified biologist will conduct a survey for active nests on structures to be removed. If a nest is identified during the survey, the nest will be removed prior to the avian nesting season and exclusion devices will be installed to prevent new nesting before the facility is removed. With the implementation of the Other Special-status Birds Construction Measures, potential effects to nesting birds from construction activities would be addressed and reduced. Refer to Section 2.2, Table 2-14, for additional details of these measures.

Additionally, approximately 0.6 acre of riparian vegetation will be removed for extension of the existing road off Scott Dam Road that provides access to the temporary barge launch at the downstream terminus of the existing plunge pool below the dam. Riparian thickets provide nesting habitat for a variety of special-status songbirds that could potentially occur in the Scott Dam Area including tricolored blackbird, purple martin, and yellow warbler; a variety of common bird species protected under the Migratory Bird Treaty Act; and game birds such as California quail (*Callipepla californica*). Upland vegetation may also require trimming and removal prior to Project ancillary and recreation facility removal. To protect nests in vegetation, PG&E will implement the Other Special-status Birds and Game Birds Construction Measures, which require PG&E to conduct vegetation clearing outside the general avian nesting season (i.e., September 1–February 14) to the extent possible. If vegetation removal must occur during the nesting season, then a pre-construction nesting survey will be conducted prior to vegetation removal and active nests would be protected with site-specific avoidance buffers, as appropriate. Refer to Section 2.2, Table 2-14, for additional details of these measures.

To further protect other special-status birds and game birds, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures.

With the implementation of construction measures, direct effects to other nesting special-status birds and game birds from nest removal or noise disturbance would be temporary and negligible.

Indirect Effects

As described previously, the majority of construction work areas, access routes, staging areas, and stockpile areas are located within the disturbed footprint of Project ancillary/recreation facilities. Vegetation removal will be required for the extension of the existing road off Scott Dam Road. This includes removal of approximately 0.6 acre of riparian vegetation. To address and reduce effects to riparian habitats for other special-status birds and game birds, PG&E will implement the

Riparian and Wetland Protection Measure, which requires that riparian vegetation removal be limited to the extent possible and that riparian vegetation outside of construction work areas be flagged for avoidance. PG&E will obtain a Clean Water Act Section 404/401 permits/certification and implement all the conditions of the permits, including riparian protection measures. Refer to Section 2.2, Table 2-14, for additional details of this measure. With the implementation of this measure, effects from riparian vegetation removal would be considered negligible.

Lake Pillsbury provides suitable foraging habitat for a variety of waterfowl such as mallards (*Anas platyrhynchos*, PG&E 2019a). Foraging habitat in the reservoir may be affected by the drawdown that would take place during the initial low-flow season. Lake Pillsbury would be drawn down to approximately 10,000 ac-ft by October of the initial low-flow season, which would reduce the potential area for waterfowl foraging. However, as described in Section 2.2, the drawdown would occur slowly, with the drawdown rate being restricted to between 1 and 2 ft. per day, giving waterfowl time to adjust and find alternative foraging habitats. Therefore, effects to foraging habitat from the reservoir drawdown would be negligible.

Use of ground-disturbing construction equipment could result in the degradation of water quality in downstream aquatic habitats from sedimentation or runoff of hazardous materials during work within Lake Pillsbury and the Eel River downstream. Degradation of water quality could, in turn, affect aquatic macroinvertebrates that represent prey species for aquatic-foraging birds such as swallows and martins. As described in detail above for bald eagle, the potential for effects to aquatic foraging habitats would be addressed and reduced by the drawdown requirements specified in Section 2.2 and the implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, and applicable Forest Service BMPs, and Riparian and Wetland Protection Measures. With the implementation of these measures, proposed construction activities in the Scott Dam Area would have negligible indirect effects on aquatic foraging habitat for other special-status birds and game birds. Effects following dam removal (including sedimentation in the Eel River) are addressed under Phase 2 – Post-facility Removal Effects.

With the implementation of construction measures, indirect effects to other special-status birds and game birds would be temporary and negligible.

Cape Horn Dam Area

The Cape Horn Dam Area contains suitable habitat for tricolored blackbird, grasshopper sparrow, olive-sided flycatcher, least bittern, loggerhead shrike, purple martin, bank swallow, and yellow warbler.

Provided below is a discussion of potential direct and indirect effects to other special-status birds or game birds that are known to or may potentially occur in the Cape Horn Dam Area.

Direct Effects

As described above for the Scott Dam Area, construction activities have the potential to directly disturb nesting of other special-status birds and game birds and potentially remove nests if present on structures to be removed as part of the Proposed Action. To address and reduce the potential for active nests to be removed during construction at the dam, PG&E will implement the Other Special-status Birds and Game Birds Construction Measures, which require a qualified biologist to survey for existing nests at Cape Horn Dam the year prior to construction. If nests are found, they will be removed outside the nesting season (September 1–February 14) and exclusion devices will be installed to prevent new nest construction. To further protect other special-status birds and game birds, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. With the implementation of these measures, any direct effects to other special-status birds and game birds from nest removal or noise disturbance would be negligible.

Indirect Effects

As described above for the Scott Dam Area, construction activities also have the potential to indirectly affect riparian nesting habitat for other special-status birds and game birds. Some vegetation removal may be required for the construction of a new temporary road to provide access to work areas near Cape Horn Dam. This temporary access road would require the removal of approximately 0.3 acre of riparian vegetation. To address and reduce effects to riparian habitats for other special-status birds and game birds, PG&E will implement the Riparian and Wetland Protection Measure, as described above for the Scott Dam Area.

Use of ground-disturbing construction equipment could result in the degradation of water quality in downstream aquatic habitats from sedimentation or runoff of hazardous materials during work within Van Arsdale Reservoir and the Eel River immediately downstream. Degradation of water quality could, in turn, affect aquatic macroinvertebrates that represent prey species for aquatic-foraging birds such as swallows and martins. As described in detail above for bald eagle, the potential for effects to aquatic foraging habitats would be addressed and reduced by the drawdown requirements specified in Section 2.2 and the implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, applicable BMPs, and Riparian and Wetland Protection Measures. Effects following dam removal (including sedimentation in the Eel River) are addressed under Phase 2 – Post-facility Removal Effects.

With the implementation of these measures, proposed construction activities in the Cape Horn Dam Area would have negligible indirect effects on nesting and aquatic foraging habitat for other special-status birds and game birds.

Potential Effects to Special-status Bat Species

The Project vicinity contains suitable habitat for a variety of special-status bat species. A comprehensive roost survey was conducted at the dams, Project ancillary facilities, and Project recreation facilities in 2018 (PG&E 2019a). Refer to Section 3.3.5, Table 3.3.5-5, for a comprehensive list of Project facilities that were evaluated as providing suitable roosting habitat and were observed to contain bat roosts.

The Analysis Area for special-status bats is defined as the Scott Dam and Cape Horn Dam construction areas (Map 2-8 and Map 2-10). The Analysis Area also includes aquatic foraging habitats such as Lake Pillsbury, Van Arsdale Reservoir, and the Eel River downstream of the dams.

Provided below is a discussion of potential direct and indirect effects to special-status bats and their habitat, categorized by geographic area.

Scott Dam Area

Special-status bats are known to occur in the Scott Dam Area, as identified by acoustic analyses completed in 2018 (PG&E 2019a). This includes pallid bat (*Antrozous pallidus*) (FSS, SSC), Townsend's big-eared bat (*Corynorhinus townsendii*) (FSS, SSC), western mastiff bat (*Eumops perotis californicus*) (SSC), western red bat (*Lasiurus blossevillii*) (SSC), and fringed myotis (*Myotis thysanodes*) (FSS). Roosts of common bat species Yuma myotis (*Myotis yumanensis*) and little brown bat (*Myotis lucifugus*) were also discovered in several of the restroom buildings at recreation facilities during bat roost studies conducted in 2018 (PG&E 2019a).

Provided below is a discussion of potential direct and indirect effects to special-status bats that are known to or may potentially occur in the Scott Dam Area.

Direct Effects

Special-status bat roosts, if present, could potentially be disturbed by dam removal and ancillary/recreation facility removal. Several facilities that were identified as potentially supporting bat roosts (PG&E 2019a) will be removed, which could result in the removal of active bat roosts if still present.

Scott Dam was evaluated and only found to contain night roosting habitat for bats. Bats use night roosts as temporary resting locations when they are actively foraging at night. Construction will take place during the day; therefore, individuals would not be directly disturbed during construction activities. However, because the dam will be removed, the roost location will be eliminated.

Restrooms at several of the recreation facilities, including Fuller Grove Group Campground, Fuller Grove Day Use Area and Boat Launch, Navy Campground, Pillsbury Pines Day Use Area and Boat Launch, and Pogie Point Campground, were found to contain day roosts. Removal of these facilities could potentially result in the removal of active day roosts. There is also some potential for maternity roosts to be present in recreation facilities to be removed. Maternity roosts containing non-volant young are particularly vulnerable because young may not be able to escape when the buildings are removed. To address and reduce potential effects to maternity and day roosts, PG&E will implement the Special-status Bat Construction Measure, that includes conducting a pre-construction survey for bat roosts in Project recreation and ancillary facilities that were identified as supporting suitable bat roosting habitat. To the extent possible, PG&E will remove structures that contain bat roosts outside the maternity roosting season (i.e., September 1 to April 30). If PG&E cannot remove structures outside the maternity roosting season, then PG&E will install exclusion measures and deterrents on the structure prior to the start of the maternity season (April 15) to discourage occupancy and/or consult with resource agencies on the best method to humanely evict bats. If a day roost were discovered, PG&E would exclude individuals prior to the removal of the facility.

To further protect special-status bats, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. With the implementation of these measures, direct effects to roosting bats from removal of roosts would be negligible.

Construction would take place during daylight hours and would not directly affect the foraging activities of bats, which are nocturnal.

Indirect Effects

Indirect effects to special-status bats include effects to roosting habitat and aquatic foraging habitat. Each is discussed further below.

Construction areas are primarily restricted to previously developed areas where Project facilities are present and would have a minimal effect on terrestrial habitat for roosting or foraging bats. As described above, both Scott Dam (which is suitable for night roosting) and recreation facilities that may be suitable for use by roosting bats would be removed. Removal of individual trees along existing roads to allow for passage of large construction equipment or to allow for removal of ancillary or recreation facilities could potentially alter habitat for tree-roosting bats. Bats typically select the largest available trees or snags for roosts that have features such as cavities or sloughing bark. In order to address and reduce impacts to habitat for tree-roosting bats, PG&E would implement General Construction Measures, including a measure that states large trees and snags (e.g., 35 inches dbh or greater) that have high value for wildlife, including roosting bats, would be avoided to the extent possible. Following completion of construction, the construction areas would be restored and would continue to provide habitat for roosting bats (refer to the Phase 2 – Post-facility Removal Effects section below). Therefore, impacts to roosting habitat for special-status bats would be negligible.

Many bat species forage for flying insects and aquatic macroinvertebrates over water. Use of ground-disturbing construction equipment could result in the degradation of water quality from sedimentation or runoff of hazardous materials, which would, in turn, affect the availability of aquatic macroinvertebrate prey. As described in detail above for bald eagle, the potential for effects to aquatic foraging habitats would be addressed and reduced by the drawdown requirements specified in Section 2.2 and the implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, applicable Forest Service BMPs, and Riparian and Wetland Protection Measures. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. With the implementation of construction measures, potential indirect effects to aquatic foraging habitat would be negligible.

With the implementation of construction measures, proposed construction activities in the Scott Dam Area would have negligible effects on roosting and aquatic foraging habitat for special-status bats.

Cape Horn Dam Area

Special-status bats are known to occur in the Cape Horn Dam Area as identified through acoustic analyses conducted in 2018. This includes pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat (PG&E 2019a). Suitable habitat for fringed myotis is also present. A roost study was conducted at Cape Horn Dam and all Project ancillary facilities in the Cape Horn Dam Area (PG&E 2019a), and roosts of the common bat species Yuma myotis were discovered. This includes a day roost in the Tunnel No. 1 Gage Shaft (Control Building) and in a cabana outbuilding in the Potter Valley Powerhouse complex. A maternity roost was identified in the Van Arsdale Fish Screen Facility Motor Control Building. Night roosting was also identified on the exterior of the Potter Valley Powerhouse; Conduit No. 2 Lower Wood Stave, Steel Pipe, and Components; and Conduit No. 1 72-inch Butterfly Valve House, Standpipe, and Surge Chamber Vent. In addition, unknown bat species were observed roosting in the Fish Attraction Facility (Fish Hotel) (A. Anderson, pers. comm. 2024). A night roost was observed on the bathroom buildings at Trout Creek Campground (PG&E 2019a).

Provided below is a discussion of potential direct and indirect effects to special-status bats that are known to or may potentially occur in the Cape Horn Dam Area.

Direct Effects

Special-status bat roosts, if present, could potentially be disturbed by the construction activities that include dam removal. Several facilities that were identified as supporting bat roosts or potentially supporting bat roosts (PG&E 2019a) will be removed and/or partially removed. The bathrooms at Trout Creek Campground would be transferred to a third party and left in place. Removal and/or partial removal of the ancillary facilities could potentially result in the removal of active bat roosts. Maternity roosts containing non-volant young are particularly vulnerable because young may not be able to escape when the buildings are removed. As described above for the Scott Dam Area, PG&E will implement the Special-status Bat Construction Measure to address and reduce impacts to bat roosts, including conducting pre-construction surveys of facilities potentially supporting bat roots, removing facilities outside the maternity roosting season, and/or installing humane exclusion devices prior to facility removal. Several facilities that will be left in place in the Cape Horn Dam Area have underground components that could be attractive for bat roosting. The Special-status Bat Construction Measure also includes an inspection of any underground structures that will be left in place or capped for the presence of bats. If bats are present, PG&E will humanely evict all bats before capping and/or decommissioning the facility. To further protect special-status bats, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of the construction measures. With the implementation of these measures, effects to bat roosts would be negligible.

Construction would take place during daylight hours and would not directly affect foraging bats, which are nocturnal.

Indirect Effects

Construction areas are primarily restricted to previously developed areas where Project facilities are present and would have minimal effect on terrestrial habitat for roosting or foraging bats. As described above, ancillary facilities that are suitable for use by roosting bats would be removed. In addition, PG&E may need to remove individual trees along existing roads to allow for passage of large construction equipment. Bats typically select the largest available trees or snags for roosts and require structures such as cavities or sloughing bark. To address and reduce impacts to habitat for tree-roosting bats, PG&E would implement General Construction Measures. This includes measures that state large trees and snags (e.g., 35 inches dbh or greater) that have high value for wildlife, including roosting bats, would be avoided to the extent possible. Following completion of construction, all construction areas would be restored and would continue to provide habitat for roosting bats (refer to the Phase 2 – Post-facility Removal Effects section below). Refer to Phase 2 – Post-facility Removal Effects below for a discussion of post-construction restoration. Therefore, impacts to roosting habitat for special-status bats would be negligible.

Use of ground-disturbing construction equipment could result in the degradation of water quality in downstream aquatic habitats from sedimentation or runoff of hazardous materials during work within Van Arsdale Reservoir and the Eel River downstream. Degradation of water quality could, in turn, affect aquatic macroinvertebrates that represent prey species for aquatic-foraging special-status bats. As described in detail above for bald eagle, the potential for effects to aquatic foraging habitats would be addressed and reduced by the drawdown requirements specified in Section 2.2 and the implementation of the Construction Water Quality and Water Temperature Monitoring Plan, Construction Erosion Prevention Plan, Water Quality and Erosion Control Measures, Hazardous Materials Handling Measures, Stormwater Pollution Prevention Plan, applicable BMPs, and Riparian and Wetland Protection Measures. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. With the implementation of construction measures, potential indirect effects to aquatic foraging habitat would be negligible.

With the implementation of these measures, proposed construction activities in the Cape Horn Dam Area would have negligible effects on roosting and aquatic foraging habitat for special-status bats.

Potential Effects to Mesocarnivores

The Project vicinity contains suitable habitat for two special-status mesocarnivores: the West Coast Distinct Population Segment of fisher (*Pekania pennanti*) (FSS, SSC) and the Pacific marten (also known as Humboldt marten) (*Martes caurina*) (FSS, ST).

The Analysis Area for special-status mesocarnivores is defined as a 0.5-mi. buffer from the boundaries of the Scott Dam and Cape Horn Dam construction areas (see Map 2-8 and Map 2-10 in Section 2.2). This buffer encompasses the construction work areas plus a disturbance buffer to account for any disturbance effects to mesocarnivores present in adjacent forested habitat.

Provided below is a discussion of potential direct and indirect effects to special-status mesocarnivores and their habitat, categorized by geographic area.

<u>Scott Dam Area</u>

The Scott Dam Area contains suitable habitat for fisher and Pacific marten (PG&E 2019a). Fishers have been observed on camera traps within 1 mi. of Lake Pillsbury (CNDDB 2024).

Suitable habitat for both fisher and marten were mapped as part of studies completed in 2018 (PG&E 2019a). There is no suitable habitat within the Scott Dam construction area footprint, but PG&E has mapped suitable habitat for fisher and marten within 0.5 mi. of Scott Dam and associated recreation facilities adjacent to Lake Pillsbury (PG&E 2019a). Therefore, special-status mesocarnivores may potentially forage and den within the Analysis Area.

Provided below is a discussion of potential direct and indirect effects to special-status mesocarnivores that are known to or may potentially occur in the Scott Dam Area.

Direct Effects

Potential direct effects to special-status mesocarnivores include disturbance from construction activities (including helicopter use, blasting, and vegetation removal) and the potential for vehicle collisions on construction routes.

As described previously, the majority of construction work areas, access routes, staging areas, and stockpile areas are located within the existing disturbed footprint of Project facilities. Due to the shy nature of these species and known tendencies to avoid more open areas (Wengert 2013; Slauson et al. 2016), fishers and Pacific martens would not likely den or forage in these developed areas under existing conditions. However, noise from construction equipment, human presence, use of explosives to remove the adit plug and flush sediments, and helicopter use could result in disturbance effects to mesocarnivores in suitable habitat in the Analysis Area.

The Proposed Action may require helicopter use during the construction period. Compared to the existing condition in which helicopter use is infrequent, this represents an increase in the potential for disturbance of these species along the helicopter route. Recent studies in Oregon indicate that fishers within 2 kilometers of helicopter logging operations change their behavior in response to the presence of helicopters and may not return to areas for up to 2 weeks post-treatment

(USFS 2020). Blasting associated with the removal of the adit plug at Scott Dam may result in similar disturbance effects.

There is some potential for fisher or marten dens to be present in the Analysis Area, and based on existing literature, loud noises from construction have the potential to alter behavior and adversely affect breeding. This effect would be temporary and limited to the period of construction; however, some potential remains for the Proposed Action to result in adverse effects to breeding mesocarnivores.

Reproductive dens are usually located in cavities in large, live or dead trees in forest stands with dense canopy cover and a complex structure. Female fishers appear to avoid moderate- and high-traffic roads when selecting den sites and tend to den away from paved and gravel roads (Thompson, C., unpublished data in USFS 2020). PG&E may need to improve existing access roads in preparation for construction. Some tree removal may be required along these roads to ensure passage of large construction vehicles and equipment (e.g., barges). Minimal removal of individual trees may also be required to allow for removal of ancillary and recreation facilities. Fishers and martens are unlikely to select denning trees adjacent to a road or in a developed recreation facility. Therefore, tree removal is unlikely to directly affect denning mesocarnivores. To further address and reduce this potential impact, PG&E will avoid removal of large trees and snags (35 inches dbh or larger) that provide high value for wildlife, including fisher and marten to the extent possible. Refer to Section 2.2, Table 2-14, for additional details of this measure. With the implementation of General Construction Measures and the Special-status Mesocarnivore Construction Measures, potential effects to denning mesocarnivores from tree removal would be negligible.

Vehicle strikes are also known to be a significant source of mortality for mesocarnivores in some areas (USFS 2020). To reduce the potential for vehicle strikes, PG&E will implement the Special-status Mesocarnivores Construction Measure, which restricts contractor speed limits within the construction areas. To further protect special-status mesocarnivores, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. With the implementation of these measures, potential effects to mesocarnivores from vehicle strikes would be negligible.

With the implementation of construction measures, direct effects to special-status mesocarnivores from tree removal and vehicle strikes would be negligible. There remains, however, some potential for adverse effects to denning mesocarnivores resulting from noise disturbance (e.g., helicopters and blasting).

Indirect Effects

The proposed construction activities in the Scott Dam Area (dam and ancillary/recreation facility removal) would result in minimal effects to denning habitat for special-status mesocarnivores for several reasons. Construction areas (work areas, access routes, staging areas, and stockpile areas) will be mostly located within the existing disturbed footprint of Project ancillary/recreation facilities. While, as described above, some limited tree removal may be required along existing roads or prior to removal of ancillary or recreation facilities, fishers are unlikely to den in the direct vicinity of developed roads and facilities. Removal of individual trees immediately adjacent to an existing road or at an existing recreation facility would therefore not significantly alter denning habitat for fisher or marten. In addition, as described in the General Construction Measures, removal of mature, large trees and snags (35 dbh or greater) that have high wildlife value and that represent potential denning structures for mesocarnivores would be avoided to the extent possible. Therefore, effects to denning habitat would be negligible.

Some riparian vegetation removal may be required for the construction of a new temporary road off Scott Dam Road to provide access to the temporary barge launch at the downstream terminus of the existing plunge pool below the dam. This temporary access road would require the removal of approximately 0.6 acre of riparian vegetation. Special-status mesocarnivores are known to use riparian corridors for dispersal and movement (USFS 2020). Removal of riparian vegetation associated with construction activities would result in very minor changes in the availability of dispersal habitat for special-status mesocarnivores in the Analysis Area. Furthermore, this riparian area is located near the existing development at Scott Dam, which special-status mesocarnivores would likely avoid under existing conditions because of routine human presence. To reduce this potential effect, PG&E will implement the Riparian and Wetland Protection Measure, which requires that riparian vegetation removal be limited to the extent possible and that riparian habitat outside of construction areas be flagged for avoidance. PG&E will also obtain Clean Water Act permits and implement all conditions of the permits (including riparian protection). Therefore, any potential effects to riparian dispersal habitat from construction would be negligible.

<u>Cape Horn Dam Area</u>

Suitable habitat for both fisher and Pacific marten is present in forested habitats in the vicinity of the Cape Horn Dam Area (PG&E 2019a). Provided below is a discussion of potential direct and indirect effects to special-status mesocarnivores that are known to or may potentially occur in the Cape Horn Dam Area.

Direct Effects

Potential direct effects to special-status mesocarnivores include disturbance from construction activities (including helicopter use and vegetation removal) and the potential for vehicle collisions on construction routes.

As described above, the majority of construction work areas, access routes, staging areas, and stockpile areas are located within the existing disturbed footprint of Project ancillary facilities and recreation facilities (Trout Creek Campground) that do not provide foraging or denning habitat for mesocarnivores. However, there is the potential for a den to be present in suitable foraging habitat in the Analysis Area, outside of developed areas.

The Proposed Action may require helicopter use during the construction period. There is some potential for a fisher or marten den to be present in the Analysis Area, and based on existing literature (refer to the effects discussion under Scott Dam), loud noises from construction have the potential to alter behavior and adversely affect breeding. This effect would be temporary and limited to the period of construction; however, some potential remains for the Proposed Action to result in adverse effects to breeding mesocarnivores.

PG&E may need to remove trees along existing access roads to ensure passage of large construction vehicles and equipment (e.g., barges) and may need to remove some trees near Project ancillary facilities. As described above, fishers and martens are unlikely to select denning trees adjacent to a road or in a developed facility. Therefore, tree removal is unlikely to directly affect denning mesocarnivores. To further address and reduce this potential impact, PG&E will avoid removal of large trees and snags (35 inches dbh or larger) that provide high value for wildlife, including fisher and marten. Refer to Section 2.2, Table 2-14, for additional details of this measure. With the implementation of General Construction Measures, potential effects to denning mesocarnivores from tree removal would be negligible.

As described above, vehicle strikes are also known to be a significant source of mortality for mesocarnivores in some areas (USFS 2020). To reduce the potential for vehicle strikes, PG&E will implement the Special-status Mesocarnivores Construction Measures, General Construction Measures, and General Wildlife Measures. Refer to Section 2.2, Table 2-14, for additional details of these construction measures. With the implementation of these measures, potential effects to mesocarnivores from vehicle strikes would be negligible.

With the implementation of construction measures, direct effects to special-status mesocarnivores from tree removal and vehicle strikes would be negligible. There remains, however, some potential for adverse effects to denning mesocarnivores resulting from noise disturbance (e.g., helicopters).

Indirect Effects

The proposed construction activities at the Cape Horn Dam Area would result in minimal effects to denning habitat for special-status mesocarnivores for several reasons. Construction areas (work areas, access routes, staging areas, and stockpile areas) will be mostly located within the existing disturbed footprint of Project ancillary facilities. While, as described above, some limited tree removal may be required along existing roads, fishers and martens are unlikely to den in the direct vicinity of developed roads and facilities. Removal of individual trees immediately adjacent to an existing road or at an existing recreation facility would therefore not significantly alter denning habitat for fisher or marten. In addition, as described in the General Construction Measures, removal of mature, large trees and snags (35 dbh or greater) that have high wildlife value and that represent potential denning structures for mesocarnivores would be avoided to the extent possible. Therefore, effects to denning habitat would be negligible.

As described above, construction activities also have the potential to indirectly affect riparian dispersal habitat for special-status mesocarnivores. Some vegetation removal may be required for the construction of a new temporary road to provide access to work areas near Cape Horn Dam.

This temporary access road would require the removal of approximately 0.3 acre of riparian vegetation. To address and reduce effects to riparian habitats for special-status mesocarnivores, PG&E will implement the Riparian and Wetland Protection Measure, as described above for the Scott Dam Area. With the implementation of this measure, potential indirect effects to special-status mesocarnivore riparian dispersal habitat would be negligible.

Potential Effects to Tule Elk or Other Game Mammals

Tule elk are known to occur on the north shore of Lake Pillsbury and also in the community of Potter Valley along the East Branch Russian River. In addition to tule elk, suitable habitat for a variety of other game mammal species such as black-tailed deer (*Odocoileus hemionus columbianus*) and black bear (*Ursus americanus*) is also present.

The Analysis Area for tule elk and other game mammals is defined as a 0.5-mi. buffer from the boundaries of the Scott Dam and Cape Horn Dam construction areas (see Map 2-8 and Map 2-10 in Section 2.2). This buffer was determined based on a study that measured avoidance distances from motorized and un-motorized recreation activities on public forests (Wisdom et al. 2018). The Analysis Area also includes the Eel River 500 feet downstream of the dams.

Provided below is a discussion of potential direct and indirect effects to tule elk and other game mammals and their habitat, categorized by geographic area.

<u>Scott Dam Area</u>

Tule elk were frequently observed along the north shore of Lake Pillsbury and in the vicinity of the Gravelly Valley Landing Field during studies conducted in 2018 (PG&E 2019a). Forests surrounding Lake Pillsbury and the Eel River downstream of Scott Dam also provide suitable habitat for a wide variety of other game mammals.

Provided below is a discussion of potential direct and indirect effects to tule elk and other game mammals that are known to or may potentially occur in the Scott Dam Area.

Direct Effects

The noise from construction equipment, human presence, use of explosives, and helicopter use could result in disturbance effects to tule elk or other game mammals foraging in the Analysis Area. These noise effects could result from both the construction activities (including helicopter use and blasting) associated with Scott Dam removal and the removal of Project recreation facilities and ancillary facilities around Lake Pillsbury.

Studies on the effect of general construction noise on elk have found that elk may increase their daily movements and alter habitat usage but that construction noises did not affect overall home ranges (Martin 2011). Adults and calves may seek out topographic barriers in response to construction disturbances (Kuck et al. 1985).

Construction may require helicopter use in the Scott Dam Area and may require the use of the Gravelly Valley Landing Field, where elk are known to occur (PG&E 2019a). Elk have been shown to be more resilient than other ungulates to helicopter noise (Brown et al. 2012), but increased helicopter use compared to the existing condition may shift their foraging behavior and cause the elk to retreat to more forested habitats (Kuck et al. 1985; Martin 2011).

Elk may also respond to novel blasting noises and heavy machinery, causing them to increase their daily movements (Olsson et al. 2007). However, elk have been shown to habituate quickly to loud noises and return to habitats from where they had been flushed (Olsson et al. 2007). Overall, elk have been shown to be more sensitive to pedestrian activities of humans such as recreation than activities associated with construction or mining (Kuck et al. 1985).

Considering that tule elk are primarily known to use the north side of Lake Pillsbury, approximately 2.5 mi. from the Scott Dam and ancillary facility (necessary for dam removal) construction areas where blasting will be conducted; that elk are relatively tolerant of helicopter noise; that elk may be more affected by pedestrian human activities than the use of heavy equipment; and that construction would be short-term and temporary, direct effects to tule elk from construction activities in the Scott Dam and ancillary facility (necessary for dam removal) construction areas would be negligible. To protect tule elk, PG&E will also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Measures, which require work to stop if special-status species and tule elk that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-14, for additional details of these construction measures.

Several Project recreation facilities are distributed on the north side of Lake Pillsbury where tule elk are known to occur. Use of helicopters, noise from ground-disturbing construction activities, and increased human presence during construction may result in flushing and disturbance of tule elk on the north side of Lake Pillsbury. However, construction would be short-term and temporary, and therefore, these effects would be negligible.

Other game mammals such as black-tailed deer may be flushed from construction areas, but these effects are expected to be temporary (restricted to the construction period), and therefore, direct effects to other game mammals from construction activities would also be negligible. Effects following dam removal (including the potential for stranding in exposed sediments within the former reservoir bed of Lake Pillsbury) are addressed under Phase 2 – Post-facility Removal Effects.

Indirect Effects

The majority of construction work areas, access routes, staging areas, and stockpile areas are located within the existing disturbed footprint of Project ancillary/recreation facilities. Work in pre-existing disturbed areas would not affect suitable foraging habitat for tule elk and other game mammals. Tule elk mostly forage on emergent herbaceous vegetation along the north shore of Lake Pillsbury and along tributary streams (PG&E 2019a).

Drawdown of Lake Pillsbury during construction could result in the degradation of riparian and wetland foraging habitat along the north shore of Lake Pillsbury. Lake Pillsbury would be drawn down to approximately 10,000 ac-ft by October of the initial low-flow season. However, as described in Section 2.2, the drawdown would occur slowly, with the drawdown rate being restricted to between 1 and 2 ft. per day, giving tule elk time to adjust and find alternative foraging habitats. The slow drawdown rate would likely also continue to support foraging resources in the short term. Therefore, effects to foraging habitat from the reservoir drawdown during construction would be negligible. However, in the long term, the removal of Lake Pillsbury and the conversion of lacustrine habitat to riverine habitat may have more significant impacts on tule elk foraging (refer to the Phase 2 – Post-facility Removal Effects discussion below under Phase 2a).

Riparian vegetation provides important foraging habitat for tule elk and other game mammals. Some riparian vegetation removal may be required for the construction of a new temporary road off Scott Dam Road to provide access to a temporary barge launch at the downstream terminus of the existing plunge pool below the dam. This temporary access road would require the removal of approximately 0.6 acre of riparian vegetation. As described above, PG&E would implement the Riparian and Wetland Protection Measure to address and reduce disturbance of riparian foraging habitat for game mammals. With the implementation of this measure, effects to riparian foraging habitat from vegetation removal would be negligible.

Cape Horn Dam Area

Tule elk are not known to occur in the immediate vicinity of Cape Horn Dam. Forests and riparian areas surrounding Van Arsdale Reservoir and the Eel River downstream of Cape Horn Dam also provide suitable habitat for a wide variety of other game mammals.

Provided below is a discussion of potential direct and indirect effects to game mammals that are known to or may potentially occur in the Cape Horn Dam Area.

Direct Effects

As described above for the Scott Dam Area, the noise from construction equipment, human presence, use of explosives, and helicopter use could result in disturbance effects to game mammals. These noise effects could result from both the construction activities associated with Cape Horn Dam removal and the removal of select Project ancillary facilities. Game mammals may be temporarily flushed or change their foraging patterns in response to elevated noise levels in the construction areas. These effects are expected to be temporary (restricted to the construction period), and therefore, direct effects to other game mammals from construction activities would be negligible.

Indirect Effects

As described above for the Scott Dam Area, construction activities also have the potential to indirectly affect riparian foraging habitat for game mammals. Some vegetation removal may be required for the construction of a new temporary road to provide access to work areas near Cape Horn Dam. This temporary access road would require the removal of approximately 0.3 acre of riparian vegetation. To address and reduce effects to riparian foraging habitats for game mammals, PG&E will implement the Riparian and Wetland Protection Measure, as described above for the Scott Dam Area. With the implementation of this measure, potential indirect effects to game mammal foraging habitat from vegetation removal would be negligible.

Phase 2: Post-facility Removal Effects

This section presents an evaluation of the potential effects of physical changes that may occur following dam and ancillary/recreation facility removal on wildlife resources, including species listed under the ESA as well as other special-status wildlife and game species. For this analysis, species have been grouped to include taxonomically similar species, including special-status invertebrates, bald eagle, northern spotted owl, other raptors, other special-status birds and game birds, special-status bats, special-status mesocarnivores, and tule elk and other game mammals. Refer to Section 3.3.5, Table 3.3.5-3, for a list of special-status wildlife species known to occur or potentially occurring in the Analysis Area and their status and habitat requirements. Section 3.3.5, Table 3.3.5-6, provides a list of resident and migratory game species potentially occurring in the Analysis Area.

- The baseline Analysis Area for the post-facility removal section includes four primary areas:
  - The Scott Dam Area – Restoration Area, which consists of the following:
    - The former Scott Dam construction areas;
    - The former Project ancillary/recreation facility construction areas; and
    - The former reservoir bed of Lake Pillsbury.
  - The Cape Horn Dam Area – Restoration Area, which consists of the following:
    - The former Cape Horn Dam construction areas;
    - The former Project ancillary facility construction areas; and
    - The former reservoir bed of Van Arsdale Reservoir.
  - The Eel River from the former Scott Dam to the Eel River estuary (i.e., Eel River Watershed)
  - The East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino (i.e., Russian River Watershed)

The baseline Analysis Area as defined above varies depending on the biology of wildlife species and is therefore further defined under each section below, where applicable.

As described above, post-facility removal effects are split into phases: Phase 2a – Initial Conditions and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration. Refer to Section 3.4.1.1 for a description of each phase.

Phase 2a includes analysis of the initial temporary physical conditions that will occur immediately following dam and ancillary/recreation facility removal, including the following:

- Loss of the facility or feature (e.g., loss of reservoir, ancillary facility, or recreation facility)
- Initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam
  - Pulse hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam until the reservoir is drained
  - Sediment load/deposition and turbidity in the Eel River downstream of Scott Dam and Cape Horn Dam
- Continued degraded water quality and sediment deposition after the initial sediment release until the system stabilizes and water quality and sediment transport returns to natural conditions
- Ground disturbance, use of heavy equipment, transport of materials to and from the Scott Dam and Cape Horn Dam Area restoration areas to allow for restoration of the former dam sites and ancillary/recreation facility sites

Phase 2b includes analysis of the resulting conditions following dam ancillary/recreation facility removal, including the following:

- Unimpaired hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam
- Restored sediment transport and water quality in the Eel River downstream of Scott Dam and Cape Horn Dam
- Natural hydrology in the East Branch Russian River
- Restored former reservoir beds and ancillary/recreation facility sites following facility removal

The following potential post-facility removal effects to wildlife resources resulting from physical changes that occur following dam and recreation facility/ancillary facility removal were evaluated:

- Potential effects to special-status invertebrate species:
  - Phase 2a
    - Direct effects to foraging individuals during restoration activities
    - Indirect effects through the conversion of lacustrine habitat to riverine habitat within the former reservoir beds
    - Indirect effects from sediment deposition in downstream riparian/wetland habitat
    - Indirect effects through the potential spread or introduction of invasive weeds during restoration activities

  - Phase 2b
    - Long-term benefit to habitat (increase in floral resources) from restoration of the former reservoir beds and return of unimpaired hydrology in the Eel River Watershed
    - Change in potential habitat in the East Branch Russian River following re-establishment of natural flow conditions

- Potential effects to bald eagle:
  - Phase 2a
    - Direct disturbance of active nests or foraging individuals during restoration activities
    - Change in bald eagle foraging and nesting habitat in the former reservoir beds
    - Indirect effects through degradation of water quality within aquatic habitats for fish prey resources following dam removal and during restoration activities
  - Phase 2b
    - Long-term beneficial effect to foraging habitat through restoration of riverine habitats in former reservoir beds and enhancement of native anadromous fish within the Eel River Watershed
    - Change in potential foraging habitat in the East Branch Russian River following re-establishment of natural flow conditions

- Potential effects to northern spotted owl:
  - Phase 2a
    - Direct disturbance of active nests or foraging individuals during restoration activities
  - Phase 2b
    - Long-term benefit through restoration of upland habitats following dam and recreation facility/ancillary facility removal

- Potential effects to other raptors:
  - Phase 2a
    - Direct disturbance of active nests or foraging individuals during restoration activities
    - Change in osprey foraging and nesting habitat in the former reservoir beds and Eel River
    - Indirect effects through degradation of water quality within aquatic habitats for fish prey resources following dam removal and during restoration activities

- Phase 2b
  - Long-term benefit to several raptor species through restoration of aquatic and upland habitats following dam and recreation facility/ancillary facility removal
  - Long-term beneficial effect to osprey foraging habitat through restoration of riverine habitats in former reservoir beds and enhancement of native anadromous fish within the Eel River Watershed
  - Long-term beneficial effect to raptors foraging in riparian and wetland habitats throughout the Eel River Watershed
  - Change in potential habitat in the East Branch Russian River following re-establishment of natural flow conditions

- Potential effects to other special-status birds, common birds, and game birds:
  - Phase 2a
    - Direct disturbance of active nests during restoration activities
    - Indirect effects from potential loss of Lake Pillsbury and riparian/wetland habitats along the shoreline
    - Indirect effects from sediment released following dam removal, including potential burial/degradation of riparian habitat, effects to macroinvertebrate prey resources, and changes in estuarine habitats
  - Phase 2b
    - Long-term benefit through restoration of upland, riparian/wetland, and aquatic habitats following dam and recreation facility/ancillary facility removal
    - Long-term benefit to special-status birds nesting and foraging in riparian and wetland habitats in the Eel River Watershed from return of natural hydrology and sediment transport dynamics
    - Change in riparian habitat in the East Branch Russian River following re-establishment of natural flow conditions

- Potential effects to special-status bat species:
  - Phase 2a
    - Indirect effects through loss of aquatic foraging habitat (reservoirs) and effects from sediment released following dam removal
  - Phase 2b
    - Long-term benefit to roosting and foraging habitat through restoration of upland and aquatic habitats following dam and recreation/ancillary facility removal
    - Long-term benefit to aquatic foraging habitat in the Eel River Watershed from return of natural hydrology and sediment transport dynamics

    - Change in potential habitat in the East Branch Russian River following re-establishment of natural flow conditions

- Potential effects to mesocarnivores:
  - Phase 2a
    - Direct disturbance of individuals during restoration activities
    - Potential collisions with vehicles necessary for restoration activities
    - Indirect effects through burial of riparian habitat from sediment released following dam removal
  - Phase 2b
    - Long-term benefit to potential habitat through restoration of aquatic and upland habitats following dam and recreation facility/ancillary facility removal
    - Change in riparian habitat in the East Branch Russian River following re-establishment of natural flow conditions
- Potential effects to tule elk and other game mammals:
  - Phase 2a
    - Direct disturbance of individuals during restoration activities
    - Potential stranding of individuals in the reservoir beds following dam removal
    - Potential attraction to active restoration sites
    - Long-term benefit to foraging habitat through restoration of aquatic and upland habitats following dam and recreation facility/ancillary facility removal
    - Change in habitat in the East Branch Russian River following re-establishment of unimpaired flow conditions

A discussion of potential post-facility removal effects on wildlife resources that could occur as a result of facility removal, with incorporation of measures, is provided below by area.

Potential Effects to Special-status Invertebrates

Provided below is a discussion of potential direct and indirect effects to special-status invertebrates and their habitat from post-facility removal, categorized by geographic area and phase. The Analysis Area for special-status invertebrates includes (1) the Scott Dam and Cape Horn Dam restoration areas (including the former reservoir beds of Lake Pillsbury and Van Arsdale Reservoir), (2) potential riparian and wetland foraging habitats along the bed and bank of the Eel River from Scott Dam to the Eel River estuary, and (3) riparian, wetland, and cropland habitats along the East Branch Russian River.

Scott Dam Area

As described under Phase 1 – Construction Effects above, the Scott Dam Area contains suitable habitat for monarch butterfly and western bumble bee. Potential effects to these species from Phase 2a and Phase 2b activities are described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential effects to special-status invertebrates in the Scott Dam Area from Phase 2a activities include direct effects to breeding and foraging individuals during restoration activities and indirect effects from conversion of lacustrine to riverine habitat in the reservoir bed and potential introduction or spread of invasive weeds during restoration activities.

Direct Effects

Following facility removal activities, the former Scott Dam and Project ancillary facility/recreation facility sites would consist of disturbed areas that would not represent breeding and foraging habitats for special-status invertebrates. Therefore, any use of heavy equipment or ground disturbance associated with restoration of these areas would not directly affect special-status invertebrates.

Following removal of Scott Dam, the bed of Lake Pillsbury will be exposed. While the majority of the reservoir bed would be unvegetated the margins of Lake Pillsbury support flowering plants that may provide foraging habitat for special-status invertebrates. Use of heavy equipment and ground disturbance associated with the restoration of the reservoir bed, if required, could result in minor disturbance effects to special-status invertebrates (e.g., flushing). Such effects would be localized, short-term, and temporary and would not significantly affect special-status invertebrates. Therefore, direct effects to special-status invertebrates from construction associated with the restoration of Lake Pillsbury would be negligible.

Indirect Effects

The tributary-influenced zones of Lake Pillsbury support forested wetland habitats, and the northern shoreline of Lake Pillsbury, which is periodically inundated, supports both wetland and upland vegetation. Several additional small wetlands were also mapped along the reservoir shoreline by Stillwater Sciences during technical studies (PG&E 2019b). These habitats support flowering vegetation that represents potential foraging habitat for special-status invertebrates. In 2018, PG&E conducted a botanical study to document plant species diversity across three transects spaced across the north shore of Lake Pillsbury from the waterline to the top of the ordinary high water mark (OHWM) (PG&E 2019a). Thirty-eight unique plant species were observed across transects, including flowering plants that represent suitable floral foraging habitat for special-status invertebrates (e.g., sky lupine [*Lupinus nanus*] and clover [*Trifolium* spp.]). Wetland habitats in the tributary-influenced zones would likely be preserved following removal of Scott Dam. Vegetation growing along the periodically inundated northern shoreline of the reservoir tolerates periodic changes in water levels under existing conditions and therefore is expected to persist in the near-term following removal of Scott Dam but may experience some loss due to the reduction in surface water. Ground disturbance and use of heavy equipment associated with implementation of the Restoration Plan could potentially result in the temporary loss of portions of these habitats as well, particularly if stabilization of soils is required in these habitats along the Eel River channel or tributary channels within the reservoir bed. Considering that these impacts would be relatively minor and small-scale and that surrounding areas support a wide diversity of flowering plants, indirect effects to special-status invertebrates would be negligible.

Restoration activities and exposure of soils within the former reservoir bed have the potential to introduce and/or spread invasive weeds that can, in turn, degrade foraging habitat for special-status invertebrates. Because invasive weeds have been documented around the entire shoreline of Lake Pillsbury, exposure of soils within the former reservoir bed has the potential to result in passive recolonization by invasive weeds. The physical (e.g., particle-size distribution) and chemical (e.g., macronutrient and micronutrient status) character of sediments may potentially create conditions that favor growth of invasive plants (Shafroth et al. 2002). For example, soils containing high micronutrients or metal levels may favor invasive plants that are more tolerant of these ions. Within the Elwha River system in Washington, for example, non-native species were often the first colonizers of exposed substrates in the former Lake Aldwell and Lake Mills reservoir beds before weed treatments were implemented (Shafroth et al. 2024). During restoration activities, PG&E will implement Invasive Weed Restoration Measures, which require staff and contractors to implement BMPs such as cleaning equipment prior to arriving onsite, minimizing soil disturbance as much as possible, using established roads to the extent possible, using certified weed-free erosion control materials, and avoiding working in invasive weed–infested areas. Refer to Section 2.2, Table 2-16, for additional details of these measures. PG&E will also implement the Restoration Plan, which addresses invasive weed species within the restoration areas. With the implementation of the Invasive Weed Restoration Measures and the Restoration Plan, effects to special-status invertebrate foraging habitat from potential introduction or spread of invasive weeds would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration. Under Phase 2b, restoration of the dam and ancillary/recreation facility sites would result in a long-term benefit to special-status invertebrates.

Over time, the former reservoir bed of Lake Pillsbury is expected to recolonize with upland and riparian vegetation and return to a riverine system. To enhance this succession process, PG&E will implement the Restoration Plan, which would re-establish the connectivity of the Eel River and tributary streams within the former reservoir bed and would enhance natural vegetation recruitment processes within the former reservoir bed. In the long term, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase both the availability and diversity of breeding and foraging habitat for special-status invertebrates.

In addition, the conversion of former Project ancillary and recreation facility sites to native upland habitats would also increase the availability of breeding and foraging habitat. Therefore, implementation of the Proposed Action, including the Restoration Plan, would result in an overall benefit to special-status invertebrates in the long term.

Cape Horn Dam Area

As described under Phase 1 – Construction Effects, the Cape Horn Dam Area contains suitable habitat for monarch butterfly and western bumble bee. Potential effects to these species from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. Potential effects to special-status invertebrates under Phase 2a at Cape Horn Dam include direct effects to breeding and foraging individuals during restoration activities and indirect effects from conversion of lacustrine to riverine habitat in the reservoir bed and potential introduction or spread of invasive weeds during restoration activities.

Direct Effects

Following construction activities, the former Cape Horn Dam and ancillary facility areas would be heavily disturbed and would not support habitat for special-status invertebrates. Similarly, construction activities in support of the restoration of the reservoir bed would be conducted in newly exposed areas along the historic river channel, which do not support flowering vegetation. Therefore, construction activities associated with restoration are not expected to directly affect special-status invertebrates.

Indirect Effects

Under existing conditions, Van Arsdale Reservoir, a narrow reservoir, supports forested wetlands as well as several small emergent wetlands that, in turn, support flowering plants that may potentially provide habitat for special-status invertebrates.

Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition (i.e., confined within the historic Eel River channel). Portions of the narrow reservoir bed would be exposed, and the surface and depth to groundwater for shoreline riparian vegetation may increase. The first high-flow event would mobilize coarser sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The nature of the changes will vary depending on the width and slope of any given portion of the reservoir bed. Relatively wide and low-gradient portions of the narrow reservoir bed will experience more sediment deposition than narrower and steeper reaches. While these changes could result in reductions in the extent of forested and emergent wetlands because of reduced water levels or from burial in sediment, new riparian vegetation may also become established over time on the new depositional surfaces (Shafroth et al. 2002, 2024). A 2024 review of several studies on the Elwha River noted that new surfaces within the former reservoirs were rapidly colonized, particularly in areas of fine sediment, within 3 to 5 years after dam removal (Shafroth et al. 2024). Additionally, sediments trapped behind Scott Dam upstream may also contain seed sources that could facilitate rapid colonization within Van Arsdale Reservoir, as was observed downstream of the Glines Canyon Dam on the Elwha River system (Shafroth et al. 2024).

Following mobilization of sediments, PG&E will restore the former reservoir bed consistent with the Restoration Plan. The focus of the restoration would be stabilization of the new river channel including native plantings, as necessary. Vegetation, including flowering plants, would persist throughout these changes and would continue to provide habitat for special-status invertebrates.

Finally, as described above, restoration activities within the former reservoir bed have the potential to introduce and/or spread invasive weeds that can, in turn, degrade foraging habitat for special-status invertebrates. During restoration activities, PG&E will implement Invasive Weed Restoration Measures to reduce the potential spread or introduction of invasive weeds. PG&E will also implement the Restoration Plan, which requires monitoring and treatment of invasive weed species within the restoration areas.

While the location and extent of riparian vegetation present along the former Van Arsdale Reservoir will change over time following dam removal, sediment mobilization, and restoration, flowering plants will persist in the area and will continue to provide habitat for special-status invertebrates. With implementation of the Restoration Plan to ensure stabilization of the riverbanks including riparian vegetation, if necessary, and with implementation of the Invasive Weed Restoration Measures to reduce the potential for introduction or spread of invasive weeds, Phase 2a effects to special-status invertebrates in the vicinity of the Cape Horn Dam Area would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the construction restoration area and the bed of Van Arsdale Reservoir. Under Phase 2b, restoration of the dam and ancillary facility sites would result in a long-term benefit to special-status invertebrates.

Following mobilization of sediments, PG&E will restore the former reservoir bed consistent with the Restoration Plan. The focus of the restoration would be stabilization of the new river channel including native plantings, as necessary. Over time, the reach of the Eel River formerly within Van Arsdale Reservoir is expected to return to a morphologic condition similar to pre-dam conditions. Similar to the patterns observed following dam removal in the Elwha River system (Shafroth et al. 2024), the river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. In other areas, the formation of new sediment bars may provide surfaces for the establishment of young riparian vegetation (Shafroth et al. 2002, 2024). The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. While the density of mature riparian vegetation decreased, increased diversity of riparian species and age class structure was observed within 3 to 5 years following dam removal on the Elwha River system (Shafroth et al. 2024). Therefore, riparian vegetation would persist throughout these changes and would continue to provide habitat for special-status invertebrates. In addition, the conversion of former Project ancillary facility sites to native upland habitats would also increase the availability of breeding and foraging habitats. Therefore, implementation of the Proposed Action, including the Restoration Plan, would result in an overall benefit to special-status invertebrates in the long term.

Eel River Watershed

Riparian, wetland, and estuarine habitats associated with the Eel River provide flowering resources that represent habitat for monarch butterflies and western bumble bees. There are existing records for western bumble bee along the Eel River near the outlet to the estuary (CNDDB 2024). Potential effects to special-status invertebrates under Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Potential effects to special-status invertebrates in the Eel River Watershed under Phase 2a are described below.

Direct Effects

Outside of the Scott Dam and Cape Horn Dam restoration areas described above, no direct restoration activities would occur within the Eel River Watershed. Therefore, there are no direct effects to special-status invertebrates in the Eel River Watershed.

Indirect Effects

As described in Section 3.4.1.5 – Botanical Resources, the effects of sediment release on riparian vegetation present along the Eel River would vary based on site-specific factors including volume of discharge, distance from the point of release, and the geomorphology of the site affected. Deposition of sediment closest to the former dam sites could result in temporary burial of some vegetation, particularly low-lying shrubs and herbaceous vegetation closest to the river channel. In the Elwha River system, sediment burial did not have measurable effects on the amount of mature riparian vegetation downstream of the removed dams within a 3- to 5-year monitoring period (Shafroth et al. 2024). Effects to riparian habitats would occur primarily in the reach from Scott Dam downstream to the confluence with the Middle Fork Eel River. Sediment deposition is expected to decrease with distance and is expected to have a minimal effect downstream of the Middle Fork Eel River and therefore would not result in detectable changes in associated riparian or estuarine habitats in this reach. Considering that special-status invertebrates are habitat generalists and are potentially present wherever flowering resources are available and that effects on riparian vegetation would be localized, temporary, and restricted to limited portions of the Eel River Watershed (i.e., from Scott Dam to the Middle Fork Eel River) and would not significantly affect availability of flowering resources, indirect effects of Phase 2a on special-status invertebrates would be negligible.

Phase 2b

From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, and deeper pools. Areas with existing overly dense riparian vegetation will be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two dams were scoured, and new channel bars formed that allowed the establishment of early successional species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native plant species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024).

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River and is not likely to result in detectable long-term changes in associated riparian and estuarine habitats.

As stated previously, special-status invertebrates are habitat generalists and are potentially present wherever flowering resources are available. Restoration of unimpaired river flow conditions and associated variable effects on riparian habitat would have a minor, neutral, or beneficial effect on special-status invertebrates.

Russian River Watershed

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the approximate 11-mi. East Branch Russian River, which runs from the powerhouse, through an alluvial valley (i.e., Potter Valley), and down through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cubic feet per second (cfs) to 225 cfs, with maximum flows of about 300 cfs for the period of record (refer to Section 3.3.1), although in recent years they have been much lower (see Figure 3.3.1-15). Since 1908, diversions from the Eel River have been used to irrigate a wide variety of irrigated croplands in Potter Valley including, but not limited to, irrigated pasture, hayfields, pears, vineyards, and other row crops (Potter Valley Irrigation District 2024). Riparian and wetland habitats are also present, primarily along the valley portion of the river. Flowering plants present within agricultural, riparian, and wetland habitats in Potter Valley provide suitable habitat for both the monarch butterfly and western bumble bee.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime, and the majority of the river from the powerhouse to the OHWM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. This would result in an alteration in the location and extent of riparian and wetland habitats, and the reduction or loss of irrigation water is likely to result in the loss of irrigated croplands. Upland habitats and dryland crops that are more tolerant of drier seasonal conditions would become more prevalent in the valley. Changes in the location and extent of these habitats over time would not result in a significant change in the availability of flowering plants, which can occur in all habitat types. Therefore, implementation of Phase 2a and Phase 2b would result in negligible effects to special-status invertebrates along the East Branch Russian River.

Potential Effects to Bald Eagle

Provided below is a discussion of potential direct and indirect effects to bald eagles and their habitat from post-facility removal, categorized by geographic area and phase. Bald eagles in California typically nest in large conifers located within 1 mi. of large bodies of water that provide aquatic foraging habitat (Jackman and Jenkins 2004). The Analysis Area for bald eagle therefore includes (1) a 1-mi. buffer of the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

<u>Scott Dam Area</u>

As described above, the Scott Dam Area is known to support six bald eagle territories. Potential effects to bald eagle under Phase 2a and Phase 2b activities are described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential effects to bald eagles in the Scott Dam Area from Phase 2a activities include disturbance of breeding and foraging individuals during restoration activities and indirect effects from conversion of lacustrine to riverine habitat in the reservoir bed.

<u>Direct Effects</u>

The noise from ground-disturbing heavy equipment, helicopter use, and increased human presence during restoration activities could result in disturbance effects to bald eagles nesting or foraging in the Analysis Area. Refer to the Phase 1 – Construction Effects section above for a detailed description of how these activities may adversely affect bald eagle nesting and foraging. Noise disturbance could result in the abandonment of eggs and/or chicks and result in nest failure.

The *National Bald Eagle Management Guidelines* (USFWS 2007) recommend implementation of the following activity-specific non-disturbance buffers between January 1 and August 1 to avoid impacts to nesting eagles:

- 1,000-ft. no-disturbance buffer (horizontal/vertical) for helicopters and fixed-wing aircraft; and
- 660-ft. no-disturbance buffer for use of heavy equipment and general construction activities.

Based on a preliminary evaluation, four of the six bald eagle territories located in the vicinity of the Scott Dam Area are within 1,000 ft. of the OHWM of Lake Pillsbury. Restoration activities may require work anywhere within the former reservoir bed, including these areas. Active nest locations may change over time, or new nest territories may also be established by the time restoration activities are implemented in the Scott Dam Area – Restoration Area.

Use of helicopters and ground-disturbing heavy equipment may adversely affect eagle nests if restoration activities occur within the buffers described above during the breeding season.

To address and reduce disturbance of nesting bald eagles during construction, PG&E will implement a Bald Eagle Conservation Plan (Section 2.2, Table 2-16, provides the full text of the plan). The Bald Eagle Conservation Plan requires the following:

- Pre-restoration nest surveys will be conducted prior to use of heavy equipment or helicopters associated with the Restoration Plan or Sediment/Channel Monitoring and Response Plan in the Scott Dam Area – Restoration Area. Surveys would be conducted consistent with methods established in PG&E's existing License Article 54 (PG&E 2004).
- Following completion of surveys, PG&E would conduct a GIS analysis of the location of active nests relative to the timing and location of restoration activities (including helicopter flight paths and heavy equipment use) and determine whether nests fall within the USFWS-recommended no-disturbance buffers (USFWS 2007). Based on this analysis, the following avoidance and protection measures would apply:
  - If bald eagle nests are found within the no-disturbance buffer of the Scott Dam Area – Restoration Area, PG&E would modify the timing of restoration activities and/or helicopter flight paths to maintain the no-disturbance buffer. Restoration activities would not proceed within this buffer until a qualified biologist determines that the nest is no longer active.
  - If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with USFWS to develop site-specific measures that consider the type of restoration activity and the specific location of the nest (topography, slope, etc.).

With implementation of the Bald Eagle Conservation Plan, as well as the General Restoration Measures and General Wildlife Restoration Measures that provide environmental training and inadvertent discovery procedures, direct effects to bald eagle would be negligible.

With implementation of the Bald Eagle Conservation Plan, General Restoration Measures, and General Wildlife Measures, direct effects to bald eagle would be avoided. Therefore, direct effects from noise disturbance during restoration would be negligible.

Indirect Effects

Immediately following dam removal, there would no longer be impounded water behind Scott Dam and the former Lake Pillsbury would be restored to a riverine habitat. This would result in the loss of available lacustrine foraging habitat, which could affect the number of bald eagle nesting territories this area is able to support. Research suggests that reservoir drawdowns can benefit eagle foraging in the short term by exposing spawning and foraging fish to predation (Jackman et al. 2007). In addition, fish carrion availability is expected to increase in the short term following drawdown and removal of the dam. However, a reduction in overall foraging area may result in adverse effects to the reproductive success of the existing bald eagle nesting territories after the first year when stranded fish have been consumed.

In California, though bald eagles are often seen foraging on both rivers and reservoirs, nests are most abundant on reservoirs (Jackman and Jenkins 2004). Therefore, loss of Lake Pillsbury may result in a reduction in nesting territories and available reservoir foraging habitat for bald eagles.

As described under Phase 2b, PG&E would implement the Restoration Plan to reduce effects to bald eagle foraging habitat over time. However, the loss of the reservoir may still result in the abandonment of nesting territories in the Scott Dam Area, resulting in a significant adverse effect.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the construction restoration area and the bed of Lake Pillsbury. Potential effects to bald eagle under Phase 2b include the long-term benefit from restoration and re-establishment of fish passage and reduced human activity within the landscape.

PG&E will implement the Restoration Plan, which includes the re-establishment of the Eel River and connected tributary streams within the former reservoir bed, enhancement of fish habitat, and removal of fish passage barriers, allowing the future recolonization of native anadromous fish within the former reservoir bed. Implementation of the Restoration Plan would reduce adverse effects to bald eagle foraging habitat by promoting the long-term recovery of fish populations and enhancing fish habitat along the re-established Eel River and tributary streams.

As described above (Phase 2a), the Eel River will be re-established within the former reservoir bed of Lake Pillsbury and anadromous fish passage will be restored and monitored consistent with the Restoration Plan. In the long term, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase the diversity, health, and distribution of the native fish community, which is expected to benefit bald eagle foraging habitat in the long term.

The conversion of former Project ancillary and recreation facility sites and reduced recreation following construction and restoration activities would also reduce the human footprint and disturbance level on the landscape. Reduced human disturbance pressure may benefit bald eagle nesting in the future. Therefore, over the long term, bald eagles would benefit from restoration of the former reservoir beds and ancillary/recreation facility sites following facility removal.

Cape Horn Dam Area

As described above, the Cape Horn Dam Area is known to support one bald eagle territory. Potential effects to this species from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. Potential effects to bald eagle in the Cape Horn Dam Area include disturbance of breeding and foraging individuals during restoration activities and indirect effects to foraging habitat from conversion of lacustrine to riverine habitat in the reservoir bed.

Direct Effects

The noise from construction equipment, human presence, and helicopter use could result in disturbance effects to bald eagles nesting or foraging in the Analysis Area. Refer to the construction effects section above for a detailed description of how these activities are known to affect bald eagles. Noise disturbance during restoration could potentially result in abandonment of eggs, chicks, or fledglings and could result in nest failure.

There is one active bald eagle territory at Van Arsdale Reservoir in the vicinity of the Cape Horn Dam construction areas (refer to Section 3.3.5, Map 3.3.5-2b). The most recent nest is approximately 1 mi. southwest of Cape Horn Dam. However, in most of the years nest monitoring has been conducted at Van Arsdale Reservoir (PG&E 2019c, 2021, 2022), eagles have utilized a nest tree on the eastern bank of the Eel River that is within 660 ft. of the Cape Horn Dam removal areas.

As described above for Scott Dam, to address and reduce disturbance of nesting bald eagles during restoration to the extent possible, PG&E will implement a Bald Eagle Conservation Plan. The Bald Eagle Conservation Plan requires a nest survey each year prior to any use of heavy equipment or helicopters under the Restoration Plan or Sediment/Channel Monitoring and Response Plan, GIS analysis to determine the location of nests in relation to the location and timing of restoration activities (including helicopter flight paths and heavy equipment use), and determining whether nests fall within the USFWS-recommended no-disturbance buffers (USFWS 2007). Based on this analysis, the following avoidance and protection measures would apply:

- If bald eagle nests are found within the no-disturbance buffer of the Cape Horn Dam Area – Restoration Area, helicopter flight paths and timing of the restoration activity would be modified to maintain the no-disturbance buffer. Restoration activities would not proceed within this no-disturbance buffer until a qualified biologist has determined that the nest is no longer active.

- If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with USFWS to develop site-specific measures that consider the type of restoration activity and the specific location of the nest (topography, slope, etc.).

With implementation of the Bald Eagle Conservation Plan, as well as the General Restoration Measures and General Wildlife Restoration Measures that provide environmental training and inadvertent discovery procedures, adverse direct effects to bald eagle would be negligible.

With implementation of the Bald Eagle Conservation Plan, General Restoration Measures, and General Wildlife Measures, adverse direct effects to bald eagle would be avoided. Therefore, direct effects from noise disturbance during restoration would be negligible.

Indirect Effects

Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition (i.e., confined within the historic Eel River channel). The reservoir is set within a relatively confined river valley, and the historic Eel River channel is expected to occupy roughly the same surface area as the former reservoir. Therefore, initial effects to fish populations are not expected from drawdown of the reservoir.

However, the first high-flow event would mobilize coarse sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. The release of accumulated sediment would result in temporary adverse effects to fish prey species inhabiting the river channel within the former reservoir during and immediately following the release of sediments from Lake Pillsbury. High suspended sediment loads will kill and adversely affect the physiology and behavior of fish species that represent prey for bald eagles, including (1) displacement of juveniles, (2) reduced feeding and growth, (3) physiological stress and respiratory impairment, (4) damage to gills, (5) reduced tolerance to disease and toxicants, (6) reduced survival, and (7) direct mortality (FERC 2022). As the transported sand and fine sediments settle on the streambed, it may also reduce the survival of incubating eggs and developing alevins in salmonid redds by impeding inter-gravel flow as well as the emergence of fry (FERC 2022).

To address and reduce the potential adverse effects of short-term increases in suspended sediment on fish species (bald eagle fish prey), PG&E proposes to implement a Construction Site Water Diversion, Dewatering, and Drawdown Plan and a Post-dam Removal Aquatic Species Management and Monitoring Plan. The Construction Site Water Diversion, Dewatering, and Drawdown Plan describes the timing and sequencing of drawdown and dam removal, which are designed to flush fine sediments from the historical river channel in the reservoir as rapidly as possible so that the duration of adverse effects on downstream biota would be as limited as possible. PG&E's Construction Site Water Diversion, Dewatering, and Drawdown Plan would time the drawdown and mobilization of sediments to coincide with seasonal high flows. PG&E's Post-dam Removal Aquatic Species Management and Monitoring Plan would include surveys and a rescue and relocation plan to reduce the effects of the Proposed Action on individual fish.

While fish carrion would increase food availability for bald eagles in the short term, this would be followed by a temporary overall decrease in availability of both carrion and live fish over Phase 2a.

Bald eagles would temporarily benefit from fish carrion in the near-term following the initial sediment release. In addition, they are opportunistic feeders (Jackman et al. 2007) and may be able to utilize other local sources of food (e.g., terrestrial species) once carrion numbers are reduced. However, Phase 2a would result in a short-term reduction in their preferred prey (fish), which could potentially result in adverse effects to the reproductive success of the existing bald eagle nesting territory.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the construction restoration areas and the bed of Van Arsdale Reservoir. PG&E will implement the Restoration Plan, which includes the re-establishment of the Eel River within the former reservoir bed, enhancement of fish habitat, and improvement of fish passage, allowing the future recolonization of native anadromous fish within the former reservoir bed. Implementation of the Restoration Plan would reduce effects to bald eagle foraging habitat by promoting the long-term recovery of fish populations and enhancing fish habitat along the re-established Eel River.

Over time, the reach of the Eel River formerly within Van Arsdale Reservoir is expected to return to a morphologic condition similar to pre-dam conditions. The river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. PG&E will implement the Restoration Plan that will include monitoring of the restoration activities. In the long term, the conversion of lacustrine habitat within Van Arsdale to a restored riverine channel that allows anadromous fish passage would benefit bald eagle foraging habitat and provide continued resources for foraging.

In addition to their aquatic foraging habitat, bald eagles are expected to benefit from the reduced human presence on the landscape once Project ancillary facilities are removed. Therefore, over the long term, bald eagles would benefit from restoration of the former reservoir beds and ancillary/recreation facility sites following facility removal.

Eel River Watershed

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Potential effects to bald eagle under Phase 2a in the Eel River are described below.

Direct Effects

There are no direct effects to bald eagle in the Eel River Watershed outside of the Scott Dam and Cape Horn Dam restoration areas described above.

Indirect Effects

Bald eagles may be indirectly affected by the effects of initial sediment release on fish populations in the Eel River downstream of the dams. Effects on fish populations are expected to vary with the distance from dam removal sites (refer to Section 3.4.1.4, Fish and Aquatic Resources).

Below Lake Pillsbury, the river flows approximately 12 mi. westward to Van Arsdale Reservoir, with an average slope of approximately 29 ft. per mi. (0.5 percent). The morphology of the reach is typical of reaches downstream of large dams that substantially regulate flow and sediment. The channel downstream of Scott Dam ranges from 100 to 180 ft. wide, with the widest portion where the river enters Van Arsdale Reservoir (based on observations from 2016 and 2017 aerial photographs, as cited in Stillwater Sciences 2021a). As the Eel River approaches Van Arsdale Reservoir, sediment transport potential decreases (Stillwater Sciences 2021a).

Following removal of the adit plug and Scott Dam (initial high-flow season), approximately 12 million cubic yards (cy) of accumulated sediment from behind the dam would be mobilized into the Eel River downstream of Scott Dam within approximately one week (Stillwater Sciences 2021b). Additional mobilization of impounded sediment from behind the dam is expected during the second high-flow season, especially during precipitation or as unstable, exposed shorelines slump into the riverbed. The amount of sediment mobilized during the second high-flow season has not been quantified but is expected to be minor compared to the amount mobilized during sediment flushing activities. Sediment released would eventually settle out in downstream reaches, creating aquatic habitats and providing substrates for riparian habitat.

Below Cape Horn Dam, the river flows 38 mi. westward to the Middle Fork Eel River, with an average slope of approximately 16 ft. per mi. (0.3 percent) (Brown and Ritter 1971). The morphology of the reach is typical of reaches downstream of large dams that substantially regulate flow and sediment.

Based on the most recent bathymetric and topographic surveys conducted in 2002 and 2006, the current capacity of Van Arsdale Reservoir is less than 390 ac-ft (PG&E 2006). The capacity data indicate that 1.7 million cy of sediment has been trapped behind the dam (McMillen Jacobs Associates 2021). Approximately 40,000–50,000 cy of sediment immediately upstream of the dam would be excavated to provide access for heavy equipment to begin demolition of Cape Horn Dam.

Following removal of the concrete gravity portion of Cape Horn Dam and lowering the existing wingwall and earthen portion of the dam, the remaining 1.65 million cy of accumulated sediment from behind the dam would be mobilized into the Eel River downstream of Cape Horn Dam during the high-flow season.

Fifteen native and non-native fish species are present or may occur in the Eel River downstream of Scott Dam. Refer to Section 3.4.1.4, Fish and Aquatic Resources, for a complete list of species known to occur or potentially occurring.

The release of accumulated sediment would result in temporary adverse effects to fish prey species inhabiting the Eel River downstream of Scott Dam during and immediately following the release of sediments from Lake Pillsbury. High suspended sediment loads will kill and adversely affect the physiology and behavior of fish species that represent prey for bald eagles, including (1) displacement of juveniles, (2) reduced feeding and growth, (3) physiological stress and respiratory impairment, (4) damage to gills, (5) reduced tolerance to disease and toxicants, (6) reduced survival, and (7) direct mortality (FERC 2022). As the transported sand and fine sediments settle on the streambed, it may also reduce the survival of incubating eggs and developing alevins in salmonid redds by impeding inter-gravel flow as well as the emergence of fry (FERC 2022).

The initial die-off of fish would temporarily increase the availability of carrion, which is also a prey source for bald eagles. However, there will be reduced fish prey available for bald eagles within the Eel River until fish populations recover from the sediment release. Bald eagle foraging is relatively adaptable; in the Pacific Northwest, bald eagles make seasonal migrations to take advantage of the seasonal salmon die-off (Walters et al. 2021), and bald eagles are able to switch prey resources (i.e., carrion, mammals, waterfowl) when fish are unavailable as a food source (Buehler 2000).

To address and reduce the potential adverse effects of short-term increases in suspended sediment on fish species (bald eagle fish prey), PG&E proposes to implement a Construction Site Water Diversion, Dewatering, and Drawdown Plan and a Post-dam Removal Aquatic Species Management and Monitoring Plan. The Construction Site Water Diversion, Dewatering, and Drawdown Plan describes the timing and sequencing of drawdown and dam removal, which are designed to flush fine sediments from the historical river channel in the reservoir as rapidly as possible so that the duration of adverse effects on downstream biota is as limited as possible. PG&E's Construction Site Water Diversion, Dewatering, and Drawdown Plan would time the drawdown and mobilization of sediments to coincide with seasonal high flows. PG&E's Post-dam Removal Aquatic Species Management and Monitoring Plan would include surveys and a rescue and relocation plan to reduce the effects of the Proposed Action on individual fish.

Even with the implementation of measures to address and reduce potential effects to fish species (bald eagle fish prey), there will still be a short-term reduction in fish prey available to bald eagles following release of sediments from Scott Dam and Cape Horn Dam, and impacts to foraging bald eagles would be considered a significant adverse effect in the Eel River between Scott Dam and the Middle Fork Eel River.

The Eel River from the Middle Fork Eel River to the Eel River estuary flows approximately 119 mi. The Middle Fork Eel River drains 753 square mi., which is a larger drainage area than that of the Upper Eel River upstream of the Middle Fork (688 square mi.). It is a major contributor of flow and sediment to the mainstem Eel River. The exceptionally high sediment yield from the watershed (Lisle 1990) is apparent in the extensive sediment bars that are nearly continuous along the river channel. About 11 mi. upstream of the estuary, the Eel River transitions into a branching channel pattern and the reach average channel slope decreases to 0.05 percent.

Twenty native and non-native fish species are present or may occur in the Eel River downstream of the Middle Fork Eel River. Refer to Section 3.4.1.4, Fish and Aquatic Resources, for a complete list of species known to occur or potentially occurring.

The duration of erosion of 12 million cy of fine sediment is calculated to take from 1 day at a discharge of 5,000 cfs to 8 days if the discharge is only 1,000 cfs. The majority of the sediment eroded from Lake Pillsbury will be transported past the dam without settling, there will be minimal potential for deposition, and the reservoir deposit will be transported directly to the Eel River estuary (Stillwater Sciences 2021b). PG&E's Construction Site Water Diversion, Dewatering, and Drawdown Plan would time the drawdown and mobilization of sediments to coincide with seasonal high flows so that fine sediment would remain suspended as it passes through the Lower Eel River and Eel River estuary to the Pacific Ocean.

The potential for fish kill in the Eel River is highest below Scott Dam and Cape Horn Dam where there are the highest concentrations of suspended fine sediments. From the confluence of the Eel River with the Middle Fork Eel River downstream to the confluence with the North Fork Eel River, flows from the Middle Fork Eel River will reduce the potential effects of fine sediment on fish species. Although effects would be reduced, suspended sediment loads are still anticipated to kill and adversely affect the physiology and behavior of fish species that represent prey for bald eagles. Therefore, the effects to foraging bald eagles in this segment would be considered short-term and significant.

Downstream of the North Fork Eel River, potential effects to fish from fine sediment would be further reduced from the increase in flows from the North Fork Eel River. Although suspended sediments and high turbidity would still be present, they are not anticipated to result in a fish kill but may continue to affect the behavior of fish species. The overall availability of prey for bald eagle would not be affected. Potential effects to foraging bald eagles downstream of the North Fork Eel River to the Eel River estuary would therefore be considered negligible.

Phase 2b

Phase 2b is the resulting conditions in the Eel River following restoration. In the long term, the return of unimpaired hydrology, natural transport of sediment, removal of the anadromous fish passage barrier (Scott Dam), and unimpeded passage upstream of Cape Horn Dam would benefit bald eagles and their foraging habitat throughout the Eel River Watershed.

Under existing conditions, anadromous fish use portions of the Eel River and its tributaries for some or all of their life stages (e.g., spawning, rearing, and migration). Fish passage would be improved in the Eel River above both dams, as described below.

Scott Dam currently impedes fish passage into historical habitat upstream of Scott Dam. The presence of these barriers contributes to suppressed anadromous fish run size. Following the removal of Scott Dam, unimpaired flows would return to the Eel River downstream of Scott Dam and fish passage would be re-established. Removal of Scott Dam will allow Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) to reach historical riverine habitats located above Scott Dam. The National Marine Fisheries Service (NMFS 2002) estimated that 2,000 to 4,000 fall Chinook salmon and winter steelhead could have spawned above Scott Dam historically. Anadromous fish can respond relatively quickly to dam removal projects; a study of salmonid response to the Glines Canyon Dam removal project on the Elwha River in Washington documented fish recolonizing reaches upstream of the dams over the course of only a few years (Duda et al. 2021).

Cape Horn Dam currently provides fish passage via the fish ladder, but following removal of Cape Horn Dam, there will be unimpeded fish passage into historical habitat upstream of Scott Dam. There is a breeding pair of bald eagles that are known to forage near Cape Horn Dam. Following dam removal, unimpeded fish passage to upstream riverine habitat is expected to increase the numbers of naturally occurring salmon and steelhead in the Eel River above Cape Horn Dam (refer to Section 3.4.1.4, Fish and Aquatic Resources).

The restored condition would result in more natural sediment transport and hydrologic processes in the Eel River but is not expected to substantially change habitat conditions or fish populations downstream of the confluence with the Middle Fork Eel River.

The restored condition would result in more natural sediment transport and hydrologic processes in the Eel River, which would enhance fish habitat complexity, increase the quantity and quality of spawning areas, and enhance forage and feeding opportunities for fish species by creating more habitat for stream-dwelling macroinvertebrates (i.e., caddisflies, mayflies, stoneflies). A more natural sediment and hydrological regime would also benefit fish habitat by increasing channel complexity, promoting pool formation, increasing side-channel rearing habitat, and facilitating a lower incidence of pathogens that cause disease.

The removal of the fish passage barrier (Scott Dam), improvement of fish passage at Cape Horn Dam, and re-establishment of unimpaired hydrology and natural sediment transport would result in an overall benefit to the fish community and habitat in the Eel River Watershed. Improved fish habitat and abundance would therefore benefit foraging bald eagles over the long term.

Russian River Watershed

The approximately 11-mi. stretch of the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino is currently stocked with rainbow trout (*O. mykiss*), which may provide a source of prey for bald eagles foraging in the area. There are no known bald eagle nesting territories along the East Branch Russian River.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime, and the majority of the river from the powerhouse to the OHWM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. Stocking would no longer occur, and the trout population would significantly diminish, reducing the suitability of this creek as foraging habitat for bald eagle. Considering that the East Branch Russian River to Lake Mendocino is a relatively small river channel, that no nesting territories are located in this area, and that alternate prey resources such as carrion or landbirds (Jackman and Jenkins 2004) would continue to be available, effects to bald eagles in the East Branch Russian River would be negligible.

Potential Effects to Northern Spotted Owl

Provided below is a discussion of potential direct and indirect effects to northern spotted owl and its habitat from post-facility removal, categorized by geographic area and phase. The Analysis Area for northern spotted owl includes (1) a 0.5-mi. buffer of the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

<u>Scott Dam Area</u>

As described above, the Scott Dam Area is known to support northern spotted owl activity centers. Historical records indicate multiple historical occurrences of northern spotted owl in this region (USFS 2024; CNDDB 2024). There are two known northern spotted owl pairs that have been observed within 2 mi. of Scott Dam since the fires in 2018 (USFS 2024), and there are multiple USFS-designated activity centers within 1 mi. of Scott Dam (USFS 2024). There are also Critical Habitat and USFS-designated activity centers within 1 mi. of the Eel River Visitor Information Kiosk. There are no USFS-designated activity centers within 1 mi. of the other recreation facility restoration areas surrounding Lake Pillsbury, but forested habitat surrounding Lake Pillsbury is suitable for spotted owl nesting (refer to Section 3.3.5, Maps 3.3.5-3a–i). Potential effects to these species from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the construction restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential effects to northern spotted owl in the Scott Dam Area from Phase 2a activities include potential disturbance of breeding and foraging individuals during restoration activities.

<u>Direct Effects</u>

The noise from construction equipment, human presence, and helicopter use during restoration activities could result in disturbance effects to northern spotted owls nesting or foraging in the Analysis Area. Refer to the construction effects section for a detailed description of how these activities may adversely affect northern spotted owl nesting and foraging. Noise disturbance could result in the abandonment of eggs and/or chicks and result in nest failure.

USFWS (2006) recommends implementing the following activity-specific no-disturbance buffers between February 1 and July 9 to avoid impacts to northern spotted owl nests:

- 0.5-mi. no-disturbance buffer (horizontal/vertical) for helicopters; and
- 0.25-mi. no-disturbance buffer for hauling on open roads, use of heavy equipment, rock crushing, and use of fixed-wing aircraft.

Restoration activities would take place within the former reservoir bed (i.e., areas within the existing OHWM of Lake Pillsbury), Scott Dam construction areas, and former Project ancillary/recreation facility areas.

Based on a preliminary evaluation, there are two USFS-designated activity centers that are located within a 0.5-mi. buffer from the Scott Dam construction areas and the former reservoir bed, and nests may therefore potentially be affected by restoration activities. Active nest locations may change over time, and new activity centers may be designated by the time restoration activities are implemented in the Scott Dam Area.

To address and reduce disruption of nesting northern spotted owls during restoration to the extent possible, PG&E will implement the Northern Spotted Owl Management Plan. Refer to Section 2.2, Table 2-16, for the goals of the plan. The Northern Spotted Owl Management Plan will require PG&E to consult with USFWS and the Mendocino National Forest to obtain the most recent information on suitable habitat and/or nests within 0.5 mi. of the restoration areas. If recent nest survey information is unavailable, PG&E will conduct one-year protocol-level nest surveys in potentially affected activity centers in the Scott Dam Area the year prior to construction activities.

Following completion of nest surveys, PG&E would conduct a GIS analysis of the location of active nests relative to the timing and location of heavy equipment and helicopter use activities under the Restoration Plan or Sediment/Channel Monitoring and Response Plan (including helicopter flight paths and heavy equipment use) and determine whether nests fall within the USFWS-recommended no-disturbance buffers (USFWS 2006). Based on this analysis, the following avoidance and protection measures would apply:

- If northern spotted owl nests are found within the no-disturbance buffer of the Scott Dam Area – Restoration Area, PG&E would modify the timing of restoration activities and/or helicopter flight paths to maintain the no-disturbance buffer. Restoration activities would not proceed within this buffer until a qualified biologist determines that the nest is no longer active.
- If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer, PG&E will consult with USFWS to develop site-specific measures that consider the type of restoration activity and the specific location of the nest (topography, slope, etc.).

To further protect northern spotted owl, PG&E will implement General Restoration Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Restoration Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures.

With implementation of the Northern Spotted Owl Management Plan, as well as the General Restoration Measures and General Wildlife Restoration Measures that provide environmental training and inadvertent discovery procedures, direct effects to northern spotted owl would be negligible.

<u>*Indirect Effects*</u>

The Scott Dam Area – Restoration Area does not contain USFWS-designated Critical Habitat and does not provide suitable nesting or foraging habitat for northern spotted owl. Therefore, there would be no indirect effects to northern spotted owl under Phase 2a. Implementation of the Restoration Plan (refer to Phase 2b below) would improve habitat conditions for northern spotted owl over the long term.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the construction restoration area and the bed of Lake Pillsbury.

With implementation of the Restoration Plan, the former reservoir bed of Lake Pillsbury is expected to recolonize with upland and riparian vegetation and return to a riverine system with a mosaic of upland, riparian, and wetland habitats. The conversion of formerly lacustrine habitat to a diverse matrix of habitat types would increase habitat heterogeneity and would likely benefit prey species for northern spotted owl (McDonald et al. 2010; Irwin et al. 2013). An increase in vegetative cover within the former reservoir bed would enhance dispersal opportunities and improve habitat connectivity for northern spotted owls in the Analysis Area. Refer to Section 2.2 for more details on the goals of the Restoration Plan.

Implementation of the Restoration Plan would also return previously disturbed areas within the former footprint of Project ancillary/recreation facilities to restored native upland habitats. Higher vegetation cover would improve habitat connectivity between suitable forest habitat patches. In addition, operation and maintenance activities would no longer be required at the dam and at Project ancillary facilities, and recreation use would decrease with the removal of Project recreation facilities. In the long term, increased habitat connectivity and reduced human disturbance pressure would benefit northern spotted owl nesting habitat.

Therefore, restoration of the former reservoir bed of Lake Pillsbury, removal and restoration of ancillary/recreation facilities, and elimination of Project operation and maintenance activities would result in a long-term benefit to northern spotted owl.

Cape Horn Dam Area

As described above, there are no USFWS-designated Critical Habitat and no designated activity centers within 1 mi. of the Cape Horn Dam Area (USFWS 2012). There are no known observations of northern spotted owl in this area (CNDDB 2024). While some suitable habitat was mapped as part of studies in 2018 (PG&E 2019a), habitat in this location is patchy and is therefore unlikely to support nesting (refer to Section 3.3.5, Maps 3.3.5-3a–i).

There are Critical Habitat and USFS-designated activity centers within 1 mi. of Trout Creek Campground (USFWS 2012). Trout Creek Campground and loop road would not be removed; and would be transferred to a third party.

Provided below is a discussion of potential indirect effects to northern spotted owl habitat in Phase 2a and Phase 2b.

Phase 2a

Because the Trout Creek Campground would be transferred, there would be no restoration activities that could directly affect northern spotted owl. There are no known occurrences and no suitable habitat for northern spotted owl within 0.5 mi. of the remainder of the Cape Horn Dam Area – Restoration Area. Therefore, restoration activities will not result in direct or indirect effects to northern spotted owl.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir. Potential benefits to northern spotted owl under Phase 2b include the long-term restoration of the ancillary facility construction areas and reduced disturbance from human activities following facility removal.

Implementation of the Restoration Plan would return previously disturbed areas within the former footprint of Project ancillary facilities to restored native upland habitats. Higher vegetation cover would improve habitat connectivity between suitable forest habitat patches. In addition, operation and maintenance activities would no longer be required at the dam and at Project ancillary facilities. In the long term, increased habitat connectivity and reduced human disturbance pressure would benefit northern spotted owl nesting habitat.

Therefore, removal and restoration of ancillary facilities and elimination of Project operation and maintenance activities would result in a long-term benefit to northern spotted owl.

Eel River Watershed

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Re-establishment of unimpaired flows to the Eel River would not affect forest habitats utilized by northern spotted owl and would have no effect on northern spotted owl under Phase 2a and Phase 2b.

Russian River Watershed

Re-establishment of unimpaired flows to the East Branch Russian River would not affect forest habitats utilized by northern spotted owl and would have no effect on northern spotted owl under Phase 2a and Phase 2b.

Potential Effects to Other Raptors

Provided below is a discussion of potential direct and indirect effects to other raptors and their habitat from post-facility removal, categorized by geographic area and phase. The Analysis Area for other raptors includes (1) a 1-mi. buffer of the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

Scott Dam Area

As described above, northern (American) goshawk, American peregrine falcon, and osprey have been recorded at Lake Pillsbury (PG&E 2019a). Other special-status raptors that may potentially occur in the Scott Dam Area include the short-eared owl, long-eared owl, and northern harrier. Potential effects to these and other raptors from Phase 2a and Phase 2b activities are described below.

Phase 2a

As described above, Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the construction restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential effects to other raptors in the Scott Dam Area from Phase 2a activities include disturbance of breeding and foraging raptors during restoration activities and indirect effects to aquatic-foraging raptors (e.g., osprey and peregrine falcon) and riparian and wetland-nesting raptors (e.g., short-eared owl, long-eared owl, and northern harrier) from conversion of lacustrine to riverine habitat in the reservoir bed.

Direct Effects

Noise from ground-disturbing heavy equipment, human presence, and helicopter use could result in disturbance effects to raptors foraging or nesting in the Analysis Area. Refer to the construction effects section above for a description of how these activities are known to affect nesting and foraging raptors. Noise disturbance could result in the abandonment of eggs and/or chicks and result in nest failure.

To reduce this potential impact, PG&E will implement the Other Raptor Restoration Measures, including the Other Raptors Measure, American Peregrine Falcon Measure, and Osprey Measure. The Other Raptors Measure requires a pre-restoration raptor survey to be conducted within 500 ft. of all work areas in the year prior to initiation of each construction season, the American Peregrine Falcon Measure requires a survey within 500 ft. of all suitable cliff-nesting habitat, and the Osprey

Measure requires osprey surveys be conducted. Following completion of these surveys, PG&E would conduct a GIS analysis of the location of active nests relative to the timing and location of restoration activities (including helicopter flight paths and heavy equipment use) and determine whether nests fall within the species-specific protective buffers established in PG&E's existing Avian Protection Plan and/or agency regulations and policies. Based on this analysis, the following avoidance and protection measures would apply:

- If raptor nests are found within the no-disturbance buffer for heavy equipment use or helicopters under the Restoration Plan or Sediment/Channel Monitoring Response Plan in the Scott Dam Area – Restoration Area, PG&E would modify the timing of restoration activities and/or helicopter flight paths to maintain the no-disturbance buffer. Restoration activities would not proceed within this buffer until a qualified biologist determines that the nest is no longer active.
- If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer for American peregrine falcon and other raptors, PG&E will consult with resource agencies to develop site-specific measures that consider the type of restoration activity and the specific location of the nest (topography, slope, etc.).
- If it is determined that restoration activities cannot be modified (timing/location) to provide the no-disturbance buffer for osprey, a qualified biologist with stop-work authority will be onsite when restoration activities commence to monitor the behavior of ospreys and to determine the level of monitoring that would be needed during the restoration period.

To further protect other raptors, PG&E will implement General Restoration Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Restoration Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures.

With implementation of these restoration measures, potential direct effects to other raptors from noise disturbance during restoration would be negligible.

Indirect Effects

Restoration activities would be limited to the former reservoir bed of Lake Pillsbury and disturbed areas within the footprint of the former Project ancillary/recreation facilities. Therefore, there would be no effects to habitat for forest- and cliff-nesting raptors under Phase 2a. However, conversion of lacustrine to riverine habitat in the former reservoir bed could result in indirect effects to aquatic-foraging raptors such as osprey and American peregrine falcon and to raptors that nest in riparian and wetland habitats.

- **Osprey.** Immediately following dam removal, there would no longer be impounded water behind Scott Dam and water within the former Lake Pillsbury would be restricted within the historic riverbed. This would result in the loss of available lacustrine foraging habitat for osprey, and stranding of fish would result in a reduction in the overall availability of live fish that represent prey for this species. As described under Phase 2b, osprey are expected to adapt to and utilize Eel River riverine habitat within the former reservoir bed over time. A recent study of nesting osprey in the Central Valley of California found that ospreys nesting along rivers had higher reproductive rates than ospreys nesting along reservoirs and ponds (Airola and Estep 2022). However, there remains, in the short term, the potential for abandonment of nesting territories in the Scott Dam Area during Phase 2a, which would represent a significant adverse effect to osprey.

- **American Peregrine Falcon.** American peregrine falcon feed on a variety of upland, riparian, and wetland birds. As described below, loss of Lake Pillsbury may displace waterbirds that represent potential prey species and could also result in minor and localized changes in riparian and wetland habitats on the shoreline that represent habitat for prey species. Therefore, changes in reservoir habitat under Phase 2a could result in a temporary and localized reduction in prey availability for peregrine falcon. Upland prey species surrounding the reservoir would be unaffected and would continue to provide a prey source for American peregrine falcon. A temporary and localized reduction in the availability of riparian and wetland birds that are potential prey species would have a negligible effect on American peregrine falcon.
- **Riparian and Wetland-Nesting Raptors.** Portions of the shoreline of Lake Pillsbury support riparian and wetland vegetation that may provide nesting and foraging habitats for special-status raptors including, but not limited to, short-eared owl, long-eared owl, and northern harrier. The tributary-influenced zones of Lake Pillsbury support forested wetland habitats, and the northern shoreline of Lake Pillsbury, which is periodically inundated, supports both wetland and upland vegetation. Several additional small wetlands were also mapped along the reservoir shoreline by Stillwater Sciences during technical studies (PG&E 2019b).

Wetland habitats in the tributary-influenced zones would likely be preserved following removal of Scott Dam. Vegetation growing along the periodically inundated northern shoreline of the reservoir tolerates periodic changes in water levels under existing conditions and therefore is expected to persist in the near-term following removal of Scott Dam but may experience some loss due to the reduction in surface water. Ground disturbance and use of heavy equipment associated with implementation of the Restoration Plan could potentially result in the temporary loss of portions of these habitats as well, particularly if stabilization of soils is required in these habitats along the Eel River channel within the reservoir bed. These effects would be relatively minor and small-scale and are not expected to significantly affect riparian and wetland-nesting and foraging raptors.

In the long term, implementation of the Restoration Plan would restore native riparian and wetland habitats along the Eel River and tributary streams within the former reservoir bed. Refer to Section 2.2 for more details on the goals of the Restoration Plan. Considering that effects to riparian and wetland habitat along Lake Pillsbury following removal of the dam would be small-scale, and with implementation of the Restoration Plan, effects to special-status raptors including but not limited to short-eared owl, long-eared owl, and northern harrier would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury. Potential effects to other raptors under Phase 2b include the long-term benefit from restoration of the dam and ancillary/recreation facility sites.

Implementation of the Restoration Plan is expected to benefit osprey and other aquatic-foraging raptors. The Eel River will be re-established within the former reservoir bed of Lake Pillsbury and anadromous fish passage will be restored consistent with the Restoration Plan. PG&E will implement the Restoration Plan that will include monitoring of the restoration activities. In the long term, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase the diversity, health, and distribution of the native fish community, which is expected to benefit aquatic foraging habitat for osprey and other aquatic-foraging raptors.

Restoration may potentially benefit American peregrine falcon. With implementation of the Restoration Plan, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would benefit habitats for prey resources. Therefore, enhancements to habitat for prey resources may benefit American peregrine falcon foraging over the long term.

In addition, over time, the former reservoir bed of Lake Pillsbury is expected to be recolonized with upland and riparian vegetation that may provide foraging and/or nesting habitat for other raptors such as short-eared owl, long-eared owl, and northern harrier. To enhance this succession process, PG&E will implement the Restoration Plan, which would re-establish the connectivity of the Eel River and tributary streams within the former reservoir bed and would enhance natural vegetation recruitment processes within the former reservoir bed. In the long term, the former reservoir bed would support a mosaic of wetland, riparian, and upland habitats along a restored riverine channel, which is expected to improve foraging habitat for other raptors in the long term. Furthermore, implementation of the Restoration Plan is expected to increase the total amount of riparian habitats within the former Lake Pillsbury reservoir bed compared to the existing condition in which riparian habitat is restricted to the tributary streams along the shoreline. Long-term monitoring of restoration sites along the Sacramento River has shown that diversity and abundance of birds increase as the sites mature over time (Golet et al. 2013). Additionally, restoration of the recreation and ancillary facility sites would result in increased nesting and foraging upland habitats compared to the existing condition. Therefore, in the long term, implementation of the Proposed Action would have beneficial effects to raptors that nest in riparian and wetland habitats. Refer to Section 2.2 for more details on the goals of the Restoration Plan.

The conversion of former Project ancillary and recreation facility sites and reduced recreation pressure following construction and restoration activities would also reduce the human footprint and disturbance level in the Analysis Area. Reduced human disturbance pressure may benefit raptor nesting in the future. Therefore, over the long term, raptors would benefit from restoration of the former reservoir beds and ancillary/recreation facility sites following facility removal.

Cape Horn Dam Area

As described above for construction effects, ospreys are known to occur in the Cape Horn Dam Area, and suitable habitat is also present for northern (American) goshawk, golden eagle, American peregrine falcon, short-eared owl, long-eared owl, northern harrier, and other common raptor species. American peregrine falcon may potentially forage in the Cape Horn Dam area, but the analysis area lacks suitable cliff-nesting structures for nesting. Potential effects to other raptors from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. Potential effects to other raptors in the Cape Horn Dam Area include direct effects to breeding and foraging raptors during restoration activities and indirect effects to aquatic-foraging raptors (e.g., osprey and peregrine falcon) and riparian and wetland-nesting raptors (e.g., short-eared owl, long-eared owl, and northern harrier) from conversion of lacustrine to riverine habitat in the reservoir bed.

Direct Effects

As described above for Scott Dam, other raptors may be directly disturbed by human presence, use of heavy equipment, and potential use of helicopters to implement the restoration activities in the Cape Horn Dam Area. To address and reduce this potential effect, PG&E will implement the Other Raptor Restoration Measures, including the Osprey Measure and Other Raptors Measure which require that nest surveys be conducted prior to use of heavy equipment and helicopters under the Restoration Plan and Sediment/Channel Monitoring and Response Plan and that species-specific no-disturbance buffers be implemented during the nesting season (as described above for the Scott Dam Area). To further protect other raptors, PG&E will also implement General Restoration Measures and General Wildlife Restoration Measures. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures. With the implementation of these measures, potential direct effects to other raptors would be negligible.

Indirect Effects

Removal of Cape Horn Dam could result in indirect effects to aquatic-foraging raptors such as osprey and American peregrine falcon and to raptors that nest in riparian and wetland habitats.

- **Osprey.** Osprey are known to nest and forage in the vicinity of Van Arsdale Reservoir. Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition (i.e., confined within the historic Eel River channel). The reservoir is set within a relatively confined river valley, and the historic Eel River channel is expected to occupy roughly the same surface area as the former reservoir. Therefore, initial effects to fish populations are not expected from drawdown of the reservoir.

However, the first high-flow event would mobilize coarse sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. The release of accumulated sediment would result in temporary adverse effects to fish prey species inhabiting the river channel within the former reservoir during and immediately following the release of sediments from Lake Pillsbury. Refer to the discussion of indirect effects to bald eagles for further information on fish effects. As described under Phase 2b, fish populations are expected to recover over time. However, there remains, in the short term, the potential for abandonment of nesting territories in the Cape Horn Dam Area during Phase 2a, which would represent a significant adverse effect to osprey.

- **Other Raptors.** American peregrine falcon and other raptors may potentially forage for small birds and mammals in the riparian zone in the Cape Horn Dam Area. Van Arsdale Reservoir is confined within a narrow river valley. Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition. The first high-flow event would mobilize coarse sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The sediment release is expected to temporarily affect the quantity (surface area) and quality of aquatic foraging habitat for waterfowl. Burial of riparian and wetland vegetation may also temporarily reduce habitat suitability for small birds and mammals; however, these effects are anticipated to be minor. A recent study of dam removals on the Elwha River system saw marginal effects to mature riparian vegetation following sediment burial (Shafroth et al. 2024). Any temporary reductions in habitat suitability would, in turn, reduce foraging opportunities for raptors. Considering that these effects are temporary, minor, and restricted to the immediate vicinity of the former reservoir, short-term changes in habitat suitability for small birds and mammalian prey would have a negligible effect on raptors such as American peregrine falcon or northern harrier potentially foraging in the area.

Phase 2b

Phase 2b is the resulting condition following restoration of the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir.

Implementation of the Restoration Plan is expected to benefit osprey and other aquatic-foraging raptors. Over time, the reach of the Eel River formerly within Van Arsdale Reservoir is expected to return to a morphologic condition similar to pre-dam conditions. The river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. PG&E will implement the Restoration Plan that will include monitoring the restoration activities. In the long term, the conversion of lacustrine habitat within Van Arsdale Reservoir to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase the diversity, health, and distribution of the native fish community, which is expected to benefit aquatic foraging habitat for osprey and other raptors in the long term.

The conversion of former Project ancillary and recreation facility sites and reduced recreation pressure following construction and restoration activities would also reduce the human footprint and disturbance level on the landscape. Reduced human disturbance pressure may benefit raptor nesting in the future. Therefore, over the long term, raptors would benefit from restoration of the former reservoir beds and ancillary/recreation facility sites following facility removal.

Eel River Watershed

Aquatic-foraging raptors such as osprey and American peregrine falcon may potentially occur within the Eel River Watershed. Other raptors that use riparian and wetland habitats such as short-eared owl, long-eared owl, and northern harrier may also potentially occur. Terrestrial raptors such as golden eagle may occur but are unlikely to be affected by the removal of facilities upstream.

Potential effects to aquatic-foraging raptors, or raptors that use riparian and wetland habitats, under Phase 2a and Phase 2b activities are described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Restoration activities are limited to the Scott Dam and Cape Horn Dam restoration areas and will not directly affect species in the Eel River Watershed. Potential direct and indirect effects to other raptors in the Eel River Watershed under Phase 2a are provided below.

- **Osprey.** As described above, the initial release of sediments from Scott Dam and Cape Horn Dam will result in short-term adverse effects to downstream fish abundance in the Eel River Watershed the year immediately following dam removal. These effects will be most severe downstream of Scott Dam and Cape Horn Dam and are not anticipated to extend beyond the confluence with the Middle Fork Eel River (refer to Section 3.4.1.4, Fish and Aquatic Resources). To address and reduce potential adverse effects of short-term increases in suspended sediment on fish species, PG&E proposes to implement a Construction Site Water Diversion, Dewatering, and Drawdown Plan and a Post-dam Removal Aquatic Species Management and Monitoring Plan. The Construction Site Water Diversion, Dewatering, and Drawdown Plan describes the timing and sequencing of drawdown and dam removal, which are designed to flush fine sediments from the historical river channel in the reservoir as rapidly as possible so that the duration of adverse effects on downstream biota is as limited as possible. PG&E's Construction Site Water Diversion, Dewatering, and Drawdown Plan would time the drawdown and mobilization of sediments to coincide with seasonal high flows. PG&E's Post-dam Removal Aquatic Species Management and Monitoring Plan would include surveys and a rescue and relocation plan to reduce the effects of the Proposed Action on individual fish.

Even with the implementation of measures to address and reduce potential effects to fish species that represent prey for osprey, there will still be a short-term reduction in fish prey available to osprey following release of sediments from Scott Dam, and impacts to foraging osprey would be a significant adverse effect.

- **Other Raptors.** The sediment release in Phase 2a may indirectly affect special-status raptors such as American peregrine falcon, northern harrier, and short-eared owl that may potentially forage in riparian and wetland areas along the Eel River by affecting small birds and mammals that live in these habitats.

The effects of sediment release on riparian vegetation present along the Eel River would vary based on site-specific factors including volume of discharge, distance from the point of release, and the geomorphology of the site affected. Deposition of sediment closest to the former dam sites could result in temporary burial of vegetation, particularly low-lying shrubs and herbaceous vegetation in proximity to the river channel. In the Elwha River system, sediment burial did not have measurable effects on the amount of mature riparian vegetation downstream of the removed dams within a 3- to 5- year monitoring period (Shafroth et al. 2024). Effects to riparian habitat would occur primarily in the reach from Scott Dam downstream to the confluence with the Middle Fork Eel River. Sediment deposition is expected to decrease with distance and is expected to have a minimal effect downstream of the Middle Fork Eel River and therefore would not result in detectable changes in associated riparian or estuarine habitats in this reach.

Effects to riparian habitat in the Eel River from Scott Dam to the Middle Fork Eel River would be site-specific and would be reduced with distance from the point of release. As described for the effects to bald eagles, the initial sediment release would result in aggradation of coarse sediments and high suspended sediment loads downstream of Scott Dam, which would temporarily affect the quantity (surface area) and quality of aquatic foraging habitat for waterfowl that represent potential prey species for peregrine falcon. Burial of riparian and wetland vegetation may temporarily reduce habitat suitability for small birds and mammals in this reach, but the creation of new channel bars and deposits would provide surfaces for early successional species to colonize rapidly, as was observed in a dam removal study on the Elwha River system (Shafroth et al. 2024). Therefore, Phase 2a will affect aquatic, riparian, and wetland habitats along the Eel River from Scott Dam to the confluence with the Middle Fork Eel River. Because effects are temporary and site-specific and would decrease with distance, they are expected to have a negligible impact on raptors foraging and nesting along this reach. Phase 2a will have no effect on raptors in riparian and estuarine habitats below the Middle Fork Eel River.

Phase 2b

In the long term, the return of unimpaired hydrology, natural transport of sediment, and removal of anadromous fish passage barriers would benefit osprey throughout the Eel River Watershed. As described above for bald eagles, the removal of the Scott Dam fish passage barrier and unimpeded fish passage at Cape Horn Dam would be expected to improve the abundance of Chinook salmon and steelhead and allow these species to reach historical riverine habitats located above Scott Dam. Anadromous fish can respond relatively quickly to dam removal projects; a study of salmonid response to the Glines Canyon Dam removal project on the Elwha River in Washington saw fish recolonizing reaches upstream of the dams over the course of a few years (Duda et al. 2021). With the removal of fish passage barriers, anadromous fish populations would re-establish within the watershed upstream of the former Scott and Cape Horn dams. This enhancement of the native anadromous fish community would be expected to benefit osprey foraging.

From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, and deeper pools. Areas with existing overly dense riparian vegetation will be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two dams were scoured, and new channel bars formed that allowed the establishment of early successional species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native plant species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024). This would result in a benefit to small birds and mammals living in these communities, which would, in turn, benefit American peregrine falcon, short-eared owl, long-eared owl, northern harrier, and other raptor species.

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River and is not likely to result in detectable long-term changes in associated riparian and estuarine habitats; therefore, effects to habitat for other raptors would be considered negligible.

Russian River Watershed

The approximately 11-mi. stretch of the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino is stocked with rainbow trout, which provide a source of prey for osprey potentially nesting or foraging in the area. In addition, diversions from the Eel River are currently used to irrigate a wide variety of croplands including, but not limited to, irrigated pastures and hayfields, pears, vineyards, and row croplands (Potter Valley Irrigation District 2024). Riparian and wetland habitats are also present, primarily along the valley portion of the river. These habitats support a variety of small bird and mammal populations that represent prey species for special-status raptors such as American peregrine falcon, short-eared owl, and northern harrier. Short-eared owls and northern harrier are ground nesters that may also use agricultural fields for nesting.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime, and the majority of the river from the powerhouse to the OWHM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. Stocking would no longer occur, and the trout population would significantly diminish, reducing the suitability of this creek as foraging habitat for osprey.

The change from a perennial to an intermittent flow regime would result in a change in the location and extent of riparian and wetland habitats, and the reduction or loss of irrigation water is likely to result in the loss of irrigated croplands. Upland habitats and dryland crops that are more tolerant of drier seasonal conditions would become more prevalent in the valley. Changes in the location and extent of these habitats over time may result in some reduction in the suitability of habitat for special-status raptors. For example, loss of irrigated pastures and hayfields, which are used as proxy wetlands by many birds in California, may result in a reduction in potential nesting habitat for short-eared owl and northern harrier. While the composition of small bird and mammal populations present may change as habitats change, overall numbers of species would likely be maintained and would continue to provide a prey source.

The Proposed Action, therefore, would result in a minor reduction of the suitability of habitat for special-status raptors in the Russian River Watershed. This effect would be considered negligible.

Potential Effects to Other Special-status Birds, Common Birds, and Game Birds

Provided below is a discussion of potential direct and indirect effects to other special-status birds and game birds and their habitat from post-facility removal, categorized by geographic area and phase. The Analysis Area for other raptors includes (1) the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

<u>Scott Dam Area</u>

Yellow warbler is known to occur near the Pillsbury Pines Day Use Area in the Scott Dam Area. The Scott Dam Area contains suitable habitat for tricolored blackbird, grasshopper sparrow, olive-sided flycatcher, least bittern, loggerhead shrike, purple martin, and bank swallow. The Scott Dam Area also contains suitable habitat for a wide variety of common and game bird species, including waterbirds.

Potential effects to other special-status birds and game birds from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential effects to other special-status birds from Phase 2a activities include direct effects from disturbance associated with restoration activities, indirect effects to nesting and foraging habitat from dam removal, and associated effects to riparian and wetland habitats along the shoreline of Lake Pillsbury.

<u>Direct Effects</u>

Most restoration activities will take place within the dewatered reservoir bed of Lake Pillsbury and the disturbed footprint of former Project ancillary/recreation facilities and will not directly affect special-status birds or game birds. However, as described in the Restoration Plan, restoration activities may require the active collection of plant material to support restoration of native habitats within the former reservoir bed of Lake Pillsbury. This may include collection of native willow cuttings or collection of native seeds. Refer to Section 2.2 for more details on the goals of the Restoration Plan. If active nests are present in collection areas, nests could potentially be removed and/or disturbed. To address and reduce this impact, PG&E will implement the Other Special-status Birds and Game Birds Restoration Measures, which require that plant collection occur outside the general avian nesting season to the extent possible. If plant collection must be conducted during the breeding season, a nest survey will be conducted in the collection areas and avoidance buffers implemented if nests are found. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures. With the implementation of these measures, any direct effects to bird nests resulting from restoration activities would be negligible.

Indirect Effects

Lake Pillsbury provides suitable foraging habitat for a variety of waterfowl such as mallards (PG&E 2019a). After dam removal, Lake Pillsbury will no longer impound water and lacustrine foraging habitat would be converted into riverine habitat and large areas of bare exposed sediment. This habitat conversion may result in the displacement of foraging waterfowl in the short term before restoration activities can improve riparian and wetland habitats within the former reservoir bed. Therefore, there may be adverse effects to foraging habitat for waterfowl during Phase 2a activities.

The shoreline of Lake Pillsbury is dominated primarily by upland vegetation including Douglas-fir–ponderosa pine forest, mixed chaparral, and annual grasslands. Riparian and other water-dependent habitats are limited and include forested wetland habitats that occupy the tributary-influenced zones of Lake Pillsbury and the northern shoreline of Lake Pillsbury, which is periodically inundated and supports both wetland and upland vegetation. Several additional small wetlands were also mapped along the reservoir shoreline by Stillwater Sciences (PG&E 2019b).

Upland habitats would not be affected by drawdown of the reservoir; therefore, Phase 2a will have no effect on special-status species such as grasshopper sparrow and olive-sided flycatcher that use upland habitats. Tributary streams will continue to support forested wetland habitats in the tributary-influenced zones, and these habitats would likely persist following removal of Scott Dam. Other wetland areas, including the vegetation growing along the periodically inundated northern shoreline of the reservoir, tolerate periodic changes in water levels under existing conditions and therefore are expected to persist in the near-term following removal of Scott Dam, but they may experience some loss due to the reduction in surface water. Minor reductions in the extent of wetland habitats along the margins of the reservoir during Phase 2a would have a negligible effect on special-status and game birds potentially using these areas, including, but not limited to, yellow warbler, purple martin, and bank swallow.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury. In the long term, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase the diversity and health of riparian and wetland ecosystems, which is expected to benefit nesting and foraging habitat for other special-status birds and game birds in the long term. Furthermore, implementation of the Restoration Plan is expected to increase the total amount of riparian habitats within the former Lake Pillsbury reservoir bed compared to the existing condition in which riparian habitat is restricted to the tributary streams along the shoreline. Following dam removal on the Elwha River system, rapid revegetation occurred on fine sediments within a 3- to 5- year monitoring period following removal of two dams, including the development of alder, cottonwood, and willow thickets within the former reservoir beds (Shafroth et al. 2024). However, areas with coarser sediments revegetated more slowly (Shafroth et al. 2024). Long-term monitoring of restoration sites along the Sacramento River has shown that diversity and abundance of birds increase as the sites mature over time (Golet et al. 2013). Additionally, restoration of the recreation and ancillary facility sites would result in increased nesting and foraging upland habitats compared to the existing condition. Therefore, in the long term, implementation of the Proposed Action would have beneficial effects to other special-status birds and game birds. Refer to Section 2.2 for more details on the goals of the Restoration Plan.

Cape Horn Dam Area

As described above, the Cape Horn Dam Area contains suitable habitat for tricolored blackbird, grasshopper sparrow, olive-sided flycatcher, least bittern, loggerhead shrike, purple martin, bank swallow, and yellow warbler. The Cape Horn Dam Area also contains suitable habitat for game birds. Potential effects to other special-status birds and game birds from Phase 2a and Phase 2b activities are described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. Potential effects to other special-status birds include direct effects from disturbance associated with restoration activities, indirect effects to nesting and foraging habitat from dam removal, and associated effects to riparian and wetland habitats along the shoreline of Van Arsdale Reservoir.

Direct Effects

As described above for the Scott Dam Area, collection of native vegetation to support restoration activities at Cape Horn Dam has the potential to remove and/or disturb active nests of other special-status birds and game birds. To address and reduce this impact, PG&E will implement the Other Special-status Birds and Game Birds Restoration Measures, which require that plant collection occur outside the general avian nesting season to the extent possible and, if not possible, a nest survey will be conducted in the collection areas and avoidance buffers be implemented if nests are found. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures. With the implementation of these measures, any direct effects to bird nests would be negligible.

Indirect Effects

Van Arsdale Reservoir is confined within a narrow river valley. Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition (i.e., confined within the historic Eel River channel).

The first high-flow event would mobilize coarse sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The sediment release is expected to temporarily affect the quantity (surface area) and quality of aquatic foraging habitat for waterfowl. Burial of riparian and wetland vegetation may temporarily reduce habitat suitability for other birds, such as yellow warbler or least bittern, in this reach.

Under existing conditions, Van Arsdale Reservoir supports forested wetlands as well as several small emergent wetlands, which may provide habitat for some riparian-nesting birds. While dam removal could result in minor reductions in the extent of forested and emergent wetlands because of reduced water levels or from burial in sediment, new riparian vegetation may also become established on the new depositional surfaces (Shafroth et al. 2002, 2024). A 2024 review of several studies on the Elwha River system noted that new surfaces within the former reservoirs were rapidly colonized, particularly in areas of fine sediment, within 3 to 5 years after dam removal (Shafroth et al. 2024). Additionally, sediments trapped behind Scott Dam upstream may also contain seed sources that could facilitate rapid vegetation colonization within Van Arsdale Reservoir, as was observed downstream of the Glines Canyon Dam in the Elwha River system (Shafroth et al. 2024). Therefore, effects to special-status birds resulting from temporary and minor changes in riparian and wetland habitat in the Cape Horn Dam Area would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the construction restoration area and the bed of Van Arsdale Reservoir. Under Phase 2b, restoration of the dam and ancillary facility sites would result in a long-term benefit to special-status birds.

Following mobilization of sediments, PG&E will restore the former reservoir bed consistent with the Restoration Plan. Refer to Section 2.2 for more details on the goals of the Restoration Plan. The focus of the restoration would be stabilization of the new river channel including native plantings, as necessary. Over time, the reach of the Eel River within Van Arsdale Reservoir is expected to return to a morphologic condition similar to pre-dam conditions. Similar to the patterns observed following dam removal in the Elwha River system (Shafroth et al. 2024), the river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. In other areas, the formation of new sediment bars may provide surfaces for the establishment of young riparian vegetation (Shafroth et al. 2002, 2024). The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. While the density of mature riparian vegetation decreased, increased diversity of riparian plant species and age class structure was observed within 3 to 5 years following dam removal on the Elwha River system (Shafroth et al. 2024). Therefore, the restored Eel River in this area would continue to provide aquatic and riparian habitat for special-status birds. Furthermore, implementation of the Restoration Plan would enhance upland habitats in former ancillary facility footprints that would provide additional habitat for special-status birds and other game birds compared to the existing condition. Therefore, in the long term, implementation of the Proposed Action would benefit other special-status birds and game birds.

<u>Eel River Watershed</u>

This discussion focuses on special-status birds that utilize the Eel River aquatic, wetland, and riparian habitat, such as bank swallow, grasshopper sparrow, yellow rail (*Coturnicops noveboracensis*) (SSC), tricolored blackbird, yellow warbler, olive-sided flycatcher, least bittern, loggerhead shrike, and purple martin. Western snowy plover (*Charadrius nivosus nivosus*) (FT, SSC) and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (FT, SE) may also be present in the Eel River estuary. While marbled murrelet (*Brachyramphus marmoratus*) (FT, SE) nest in forested habitat along the Eel River, this species makes direct flights to oceanic foraging habitats and does not utilize riverine habitats for any part of its life cycle; therefore, it would not be affected by the Proposed Action and is not addressed further in this section.

Phase 2a

As described above, Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Potential effects to special-status invertebrates in the Eel River Watershed under Phase 2a are described below.

<u>Direct Effects</u>

Outside of the Scott Dam and Cape Horn Dam restoration areas described above, no direct restoration activities would occur within the Eel River Watershed. Therefore, use of heavy equipment or helicopters for restoration activities would have no direct effects on other special-status birds nesting downstream in the watershed.

<u>Indirect Effects</u>

The sediment release in Phase 2a may indirectly affect special-status birds by affecting their habitats. The duration of erosion of upstream sediment during the initial high-flow event following dam removal was estimated to take from 1 to 8 days depending on the rate of discharge. Based on sediment transport modeling completed for the Proposed Action (refer to Section 3.4.1.8), it is expected that the majority of coarse sediment will be deposited prior to the confluence with the Middle Fork Eel River. In addition, some of the suspended fine sediment may deposit and alter channel or floodplain morphology in this reach, at least temporarily until subsequent high-flow events can resuspend it and transport it farther downstream. Flow from major tributaries downstream will diminish the effect of the elevated sediment load, and it is likely that alterations to the existing channel morphology will become difficult to distinguish downstream of the confluence with the Middle Fork Eel River (located 38 mi. downstream of Van Arsdale Reservoir).

The effects of sediment release on riparian vegetation present along the Eel River would vary based on site-specific factors including volume of discharge, distance from the point of release, and the geomorphology of the site affected. Deposition of sediment closest to the former dam sites could result in temporary burial of vegetation, particularly low-lying shrubs and herbaceous vegetation in proximity to the river channel. In the Elwha River system, sediment burial did not have measurable effects on the amount of mature riparian vegetation downstream of the removed dams within a 3- to 5-year monitoring period (Shafroth et al. 2024). Effects to riparian habitat would occur primarily in the reach from Scott Dam downstream to the confluence with the Middle Fork Eel River. Sediment deposition is expected to decrease with distance and is expected to have a minimal effect downstream of the Middle Fork Eel River and therefore would not result in detectable changes in associated riparian or estuarine habitats in this reach.

The effects of sediment release under Phase 2a, therefore, may result in temporary effects to waterfowl and to bird species that utilize riparian habitats in and along the Eel River from Scott Dam to the confluence with the Middle Fork Eel River. Effects would be site-specific and would be reduced with distance from the point of release. As described for effects to bald eagles, the initial sediment release would result in aggradation of coarse sediments and high suspended sediment loads downstream of Scott Dam, which would temporarily affect the quantity (surface area) and quality of aquatic foraging habitat for waterfowl. Burial of riparian and wetland vegetation may temporarily reduce habitat suitability for other birds, such as yellow warbler or least bittern, in this reach, but the creation of new channel bars and deposits would provide surfaces for early successional species to colonize rapidly, as was observed in a dam removal study on the Elwha River system (Shafroth et al. 2024). Because Phase 2a would not result in detectable changes in associated riparian or estuarine habitats downstream of the Middle Fork Eel River, there would be no effect to species along this reach, including species potentially present in the Eel River estuary such as western snowy plover and western yellow-billed cuckoo.

Phase 2a will affect aquatic, riparian, and wetland habitats along the Eel River from Scott Dam to the confluence with the Middle Fork Eel River. Because effects are temporary and site-specific and would decrease with distance, they are expected to have a negligible impact on special-status birds along this reach. Phase 2a will have no effect on special-status birds below the Middle Fork Eel River.

Phase 2b

Phase 2b is the resulting conditions in the Eel River following restoration. From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. It is likely that the currently over-coarsened sediment gradation in the reach will become less coarse with the renewed sediment supply. Long-term aggradation may occur that raises the bed elevation profile, though much of the sediment initially deposited will likely be remobilized in subsequent floods and transported farther downstream. Temporary filling of pools may occur, and more pronounced sediment bars may form that will promote development of a more sinuous channel. Areas with existing overly dense riparian vegetation will be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two removed dams were scoured, and new channel bars formed that allowed the establishment of early successional species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024). These changes to riparian habitat in the Eel River would have a neutral to beneficial effect on special-status birds.

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River, is not likely to result in detectable long-term changes in associated riparian and estuarine habitats, and would therefore have no effect on special-status birds.

Russian River Watershed

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the 11-mi. East Branch Russian River, which runs from the powerhouse, through an alluvial valley (i.e., Potter Valley), and up through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cfs to 225 cfs, with maximum flows of about 300 cfs for the period of record (see Section 3.3.1), although in recent years they have been much lower (see Figure 3.3.1-15). Since 1908, diversions from the Eel River have been used to irrigate a wide variety of croplands in Potter Valley including, but not limited to, irrigated pastures and hayfields, pears, vineyards, and row croplands (Potter Valley Irrigation District 2024). Riparian and wetland habitats are also present, primarily along the valley portion of the river. The river and surrounding natural and agricultural lands may support aquatic-foraging birds such as swallows and martins, and birds such as least bittern and yellow warbler may use riparian and wetland habitats. Colonies of tricolored blackbird are known to utilize irrigated hayfields in the valley (CNDDB 2024).

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime in the river, and the majority of the river from the powerhouse to the OHWM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. This would result in an alteration in the location and extent of riparian and wetland habitats, and the reduction or loss of irrigation water is likely to result in the loss of irrigated croplands. Upland habitats and dryland crops that are more tolerant of drier seasonal conditions would become more prevalent in the valley. While the degree of changes resulting from the Proposed Action is unknown, changes in the location and extent of these habitats may potentially reduce the amount and/or suitability of these habitats for some special-status birds. Potential loss of the irrigated hay fields and pastures could reduce or eliminate habitat for tricolored blackbird colonies that have been documented in the area, which would represent a potentially significant adverse effect for this species. Effects would likely be negligible for other species. For example, swallows and martins can also forage over upland habitats. In addition, an increase in upland habitats over time, such as grassland or oak woodland habitats, could provide habitat for upland species such as olive-sided flycatcher. Therefore, implementation of Phase 2a and Phase 2b would result in significant adverse effects to tricolored blackbirds, and negligible effects to other special-status birds along the East Branch Russian River.

Potential Effects to Special-status Bat Species

Provided below is a discussion of potential direct and indirect effects to special-status bats and their habitat from post-facility removal, categorized by geographic area and phase. The Analysis Area for special-status bats includes (1) the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

Scott Dam Area

As described above, special-status bats known to occur in the Scott Dam Area include pallid bat, Townsend's big-eared bat, western mastiff bat, western red bat, and fringed myotis. Common bat species are also known to occur in the Scott Dam Area.

Potential effects to special-status bats from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential effects to special-status bats from Phase 2a activities include direct effects from disturbance associated with restoration activities and indirect effects to aquatic foraging habitats.

Direct Effects

Following completion of construction, PG&E will restore areas affected by the removal of the dam and ancillary and recreation facilities. These areas would not support roosting habitat, and therefore, use of heavy equipment or ground disturbance associated with restoration activities would not directly affect roosting bats. Special-status bats may potentially forage over uplands in the vicinity of the restoration areas. Bats typically forage at dawn and dusk. Restoration activities would be restricted to daylight hours and therefore would not result in disturbance of overland foraging bats. Therefore, restoration activities conducted under Phase 2a would not result in direct effects to special-status bats.

Indirect Effects

Many bat species forage over water. Immediately following dam removal, Lake Pillsbury would no longer impound water and would revert to riverine habitat with large areas of exposed sediment. This rapid alteration of habitat could result in a temporary reduction in the availability of some invertebrate prey species for special-status bats. Specifically, populations of some aquatic macroinvertebrates may be reduced as a result of the reduction in lacustrine habitat. In addition, increased bedload sediment transport and deposition within the remaining Eel River channel could affect aquatic macroinvertebrate prey by increasing physiological stress, reducing growth rates, or causing direct mortality (Reid and Anderson 2000; Orr et al. 2008). However, moist, bare soil areas; ponded water remaining on the dewatered reservoir bed; and remaining riparian and wetland habitats along the margins of the former reservoir bed would continue to provide habitat for a wide variety of aquatic and terrestrial invertebrates. Therefore, while facility removal may temporarily alter the types of prey species available for special-status bats, overall availability of prey is not expected to be reduced. Therefore, indirect effects to foraging bats would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury. Potential effects to special-status bats under Phase 2b include the long-term benefit from restoration of the former reservoir bed and Project ancillary/recreation facility sites.

As described above, in the long term, with implementation of the Restoration Plan, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase the diversity and health of riparian and wetland ecosystems and the aquatic macroinvertebrate community. Additionally, restoration of the recreation and ancillary facility sites would result in increased upland roosting and upland habitats compared to the existing condition. Therefore, implementation of the Proposed Action would benefit roosting and foraging habitat for special-status bats in the long term.

Cape Horn Dam Area

As described above, pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat are known to occur in the Cape Horn Dam Area. Potential effects to special-status bats from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. As described above for Scott Dam, restoration areas do not provide suitable roosting habitat and construction activities would be conducted during daylight hours and therefore would not result in disturbance to bats foraging at dawn and dusk.

Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition (i.e., confined within the historic Eel River channel). Portions of the narrow reservoir bed would be exposed, and the surface and subsurface water source for shoreline riparian vegetation would be reduced. The first high-flow event would mobilize coarser sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The nature of the changes will vary depending on the width and slope of any given portion of the reservoir bed.

Relatively wide and low-gradient portions of the narrow reservoir bed will experience more sediment deposition than narrower and steeper reaches.

As described above, increased bedload sediment transport and deposition within the Eel River channel within the reservoir bed could affect aquatic macroinvertebrate prey by increasing physiological stress, reducing growth rates, or causing direct mortality (Reid and Anderson 2000; Orr et al. 2008). However, moist, bare soil areas and remaining riparian and wetland habitats would continue to provide habitat for a wide variety of aquatic and terrestrial invertebrates. Therefore, while facility removal may temporarily alter the types of prey species available for special-status bats, overall availability of prey is not expected to be reduced. Therefore, indirect effects to foraging bats would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir. Potential effects to other special-status bats under Phase 2b include the long-term benefit from restoration of the former reservoir bed and Project ancillary facility sites.

PG&E will implement the Restoration Plan, which would enhance natural vegetation recruitment processes within the former Van Arsdale Reservoir bed. In the long term, the conversion of Van Arsdale Reservoir to a restored riverine channel that allows for natural sediment transport dynamics would benefit riparian and wetland habitats and aquatic macroinvertebrate prey resources for special-status bats. Additionally, restoration of the recreation and ancillary facility sites would result in increased upland roosting and upland habitats compared to the existing condition. Therefore, implementation of the Proposed Action would benefit roosting and foraging habitat for special-status bats in the long term.

Eel River Watershed

Special-status bats may potentially occur in the Eel River Watershed downstream of the Scott and Cape Horn Dam removal areas. These bats may forage over aquatic habitats that could potentially be affected by post-facility removal. Potential effects to special-status bats from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary.

Direct Effects

Outside of the Scott Dam and Cape Horn Dam restoration areas described above, no direct restoration activities would occur within the Eel River Watershed. Therefore, use of heavy equipment or helicopters for restoration activities would have no direct effects on other special-status bats in the watershed.

Indirect Effects

Phase 2a is not expected to indirectly affect special-status bats. As described previously, sediment transport modeling of the dam removal (refer to Section 3.4.1.8) indicates that the majority of coarse sediment will be deposited prior to the confluence with the Middle Fork Eel River. In addition, some of the suspended fine sediment may deposit and alter channel or floodplain morphology in this reach, at least temporarily until subsequent high-flow events can resuspend it and transport it farther downstream. Flow from major tributaries downstream will diminish the effect of the elevated sediment load, and it is likely that alterations to the existing channel morphology will become difficult to distinguish downstream of the confluence with the Middle Fork Eel River (located 38 mi. downstream of Van Arsdale Reservoir).

As described previously, increased bedload sediment transport and deposition within the Eel River channel could affect aquatic macroinvertebrate prey by increasing physiological stress, reducing growth rates, or causing direct mortality (Reid and Anderson 2000; Orr et al. 2008). However, moist, bare soil areas and remaining riparian and wetland habitats would continue to provide habitat for a wide variety of aquatic and terrestrial invertebrates. Therefore, under Phase 2a, while there may be a temporary alteration in the types of prey species available for special-status bats, overall availability of prey is not expected to be reduced. Therefore, indirect effects to foraging bats would be negligible.

Phase 2b

Phase 2b is the resulting conditions in the Eel River following restoration. From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. It is likely that the currently over-coarsened sediment gradation in the reach will become less coarse with the renewed sediment supply. Long-term aggradation may occur that raises the bed elevation profile, though much of the sediment initially deposited will likely be remobilized in subsequent floods and transported farther downstream. Temporary filling of pools may occur, and more pronounced sediment bars may form that will promote development of a more sinuous channel. Areas with existing overly dense riparian vegetation will be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two dams were scoured, and new channel bars formed that allowed the establishment of early successional plant species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native plant species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024). These changes in the Eel River would have a neutral to beneficial effect on special-status bats and on the aquatic and terrestrial invertebrate species that constitute their diet.

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River, is not likely to result in detectable long-term changes in associated riparian and estuarine habitats, and would have no effect on special-status bats.

Russian River Watershed

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the 11-mi. East Branch Russian River, which runs from the powerhouse, through an alluvial valley (i.e., Potter Valley), and up through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cfs to 225 cfs, with maximum flows of about 300 cfs for the period of record (see Section 3.3.1) although in recent years they have been much lower (see Figure 3.3.1-15). Since 1908, diversions from the Eel River have been used to irrigate a wide variety of croplands in Potter Valley including, but not limited to, irrigated pastures and hayfields, pears, vineyards, and row croplands (Potter Valley Irrigation District 2024). Riparian and wetland habitats are also present, primarily along the valley portion of the river. The area, therefore, provides a wide variety of habitats that may be used by special-status bats. For example, the river supports aquatic macroinvertebrates, while riparian, wetland, and cropland habitats would support a variety of other terrestrial and flying insects that may represent prey for bat species. Large trees and snags along the river may provide roosting habitat for tree-roosting bats.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime in the river, and the majority of the river from the powerhouse to the OHWM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. This would result in an alteration in the location and extent of riparian and wetland habitats, and the reduction or loss of irrigation water is likely to result in the loss of irrigated croplands. Upland habitats and dryland crops that are more tolerant of drier seasonal conditions would become more prevalent in the valley. Changes in the location and extent of these habitats may result in a change in the types of invertebrate prey available. For example, fewer aquatic macroinvertebrates would be present during the summer, when the creek is dry (although pooled water would likely remain in some areas), and the proportion of insects typical of upland habitats may increase over time. However, overall prey availability would likely be maintained. Riparian habitat may be reduced in some areas, but valley oaks and other trees that can tolerate seasonal flows would be expected to persist. Some large trees may be affected by the reduction of surface water, potentially resulting in increased availability of large snags that can be used by wildlife, including roosting bats. Therefore, implementation of the Proposed Action may affect special-status bats in the Russian River Watershed; however, effects would be negligible.

Potential Effects to Mesocarnivores

Provided below is a discussion of potential direct and indirect effects to mesocarnivores and their habitat from post-facility removal, categorized by geographic area and phase. The Analysis Area for special-status mesocarnivores includes (1) a 0.5-mi. buffer of the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

<u>Scott Dam Area</u>

As described for construction effects, fisher and Pacific marten may potentially occur in the Scott Dam Area. Potential effects to mesocarnivores from Phase 2a and Phase 2b activities are further described below.

Phase 2a

As described above, Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury, immediately following facility removal. Provided below is a discussion of potential direct and indirect effects to special-status mesocarnivores from Phase 2a activities in the Scott Dam Area.

<u>Direct Effects</u>

Potential direct effects to special-status mesocarnivores include disturbance associated with restoration activities and the potential for vehicle collisions on restoration routes.

As described above, the majority of restoration work areas, access routes, staging areas, and stockpile areas are located within the existing disturbed footprint of Project facilities. Due to the shy nature of these species and known tendencies to avoid more open areas (Wengert 2013; Slauson et al. 2016), fishers and Pacific martens would not likely den or forage in these areas under existing conditions. However, noise from ground-disturbing heavy equipment, human presence, and helicopter use could result in disturbance effects to mesocarnivores in suitable habitat in the Analysis Area. Studies in Oregon indicate that fishers within 2 kilometers of helicopter logging operations change their behavior in response to the presence of helicopters and may not return to areas for up to 2 weeks post-treatment (USFS 2020). Therefore, there is some potential for loud noises from restoration to alter behavior and to adversely affect breeding. This effect would be temporary and limited to the period of restoration activities; however, some potential remains for the Proposed Action to result in adverse effects to breeding mesocarnivores.

In addition, restoration activities would result in an increase in the number of vehicles traveling along local roads and restoration area access routes. Vehicle collisions are also known to be a significant source of mortality for mesocarnivores in some areas (USFS 2020). To reduce the potential for vehicle strikes, PG&E will implement the Special-status Mesocarnivores Restoration Measure, which restricts contractor speed limits within the restoration areas. To further protect special-status mesocarnivores, PG&E will also implement General Restoration Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Restoration Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to PG&E as soon as practicable. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures. With the implementation of these measures, potential effects to mesocarnivores from vehicle strikes would be negligible.

With the implementation of post-facility removal measures, direct effects to special-status mesocarnivores from vehicle strikes would be negligible. There remains, however, some potential for adverse effects to denning mesocarnivores resulting from noise disturbance (e.g., helicopters and use of heavy equipment).

Indirect Effects

The Scott Dam Area – Restoration Area is located within the former reservoir bed of Lake Pillsbury and in disturbed areas associated with Project ancillary/recreation facility sites. These areas do not contain suitable habitat for special-status mesocarnivores. Therefore, there would be no indirect effects to mesocarnivores under Phase 2a.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury. Under Phase 2b, restoration of the former reservoir bed of Lake Pillsbury and Project ancillary/recreation facility sites would result in a long-term benefit to mesocarnivores.

Under current conditions, Lake Pillsbury does not represent suitable habitat and may represent a dispersal barrier for mesocarnivores that require forested habitats with dense vegetation cover for dispersal. Over time, the former reservoir bed of Lake Pillsbury is expected to recolonize with upland and riparian vegetation. To further enhance this succession process, PG&E will implement the Restoration Plan, which would enhance the connectivity of the Eel River and tributary streams within the former reservoir bed and would enhance natural vegetation recruitment processes within the former reservoir bed. In the long term, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would provide a dispersal corridor for mesocarnivores and would potentially provide additional denning and foraging habitat in upland areas. Refer to Section 2.2 for more details on the goals of the Restoration Plan. Additionally, the conversion of former Project ancillary and recreation facility sites to natural habitats and reduced recreation pressure following construction and restoration activities would also reduce the human footprint and disturbance level on the landscape, which would benefit mesocarnivores. Therefore, implementation of the Proposed Action would have beneficial effects to mesocarnivores and their habitat in the long term.

Cape Horn Dam Area

As described above, fisher and Pacific marten may potentially occur in the Cape Horn Dam Area. Potential effects to mesocarnivores from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. Potential effects to mesocarnivores in the Cape Horn Dam Area include potential disturbance to individuals during restoration activities.

Direct Effects

As described above, noise from ground-disturbing heavy equipment and helicopter use during restoration could result in disturbance to mesocarnivores denning or foraging in the vicinity. Increased vehicle traffic associated with restoration activities may also increase risk of vehicle collisions. To address and reduce these effects, PG&E will implement the Special-status Mesocarnivore Restoration Measures, General Restoration Measures, and General Wildlife Restoration Measures, as described above for Scott Dam. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures. With the implementation of these measures, potential direct effects to special-status mesocarnivores from vehicle collisions would be negligible. There remains, however, some potential for adverse effects to denning mesocarnivores resulting from noise disturbance (e.g., helicopters and blasting).

Indirect Effects

The Cape Horn Dam Area – Restoration Area is located within the former reservoir bed of Van Arsdale Reservoir and in disturbed areas associated with Project ancillary facility sites. These areas do not contain suitable habitat for special-status mesocarnivores. Therefore, there would be no indirect effects to mesocarnivores under Phase 2a.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir. Under Phase 2b, restoration of the dam and ancillary facility sites would result in a long-term benefit to mesocarnivores.

As described above for Scott Dam, the implementation of the Restoration Plan would enhance natural vegetation recruitment processes within the former Van Arsdale Reservoir bed. Furthermore, implementation of the Restoration Plan would enhance riparian habitats that represent potential dispersal habitat for mesocarnivores. Mesocarnivores are also expected to benefit from the reduced human presence on the landscape once Project ancillary facilities are removed. Therefore, in the long term, the Proposed Action is expected to have a beneficial effect on mesocarnivores.

Eel River Watershed

Special-status mesocarnivores may occur in the Eel River Watershed downstream of Scott and Cape Horn dams. Mesocarnivores may disperse and forage along riparian habitats found along the Eel River, particularly where these riparian habitats abut mature coniferous forests. Potential effects to mesocarnivores under Phase 2a and Phase 2b are described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Restoration activities are limited to the Scott Dam and Cape Horn Dam restoration areas and will not directly affect species in the Eel River Watershed. Potential effects to mesocarnivores under Phase 2a include temporary modification of dispersal habitat following dam removal and the initial sediment release.

Phase 2b

From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, and deeper pools. Areas with existing overly dense riparian vegetation will be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two dams were scoured, and new channel bars formed that allowed the establishment of early successional species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024).

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River and is not likely to result in detectable long-term changes in associated riparian and estuarine habitats.

Restoration of unimpaired river flow conditions, and associated variable effects on riparian habitat, would have a minor, neutral, or beneficial effect on special-status mesocarnivores.

Russian River Watershed

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the 11-mi. East Branch Russian River, which runs from the powerhouse, through an alluvial valley (i.e., Potter Valley), and up through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cfs to 225 cfs, with maximum flows of about 300 cfs for the period of record (see Section 3.3.1) although in recent years they have been much lower (see Figure 3.3.1-15). Since 1908, diversions from the Eel River have been used to irrigate a wide variety of croplands in Potter Valley including, but not limited to, irrigated pastures and hayfields, pears, vineyards, and row croplands (Potter Valley Irrigation District 2024). Riparian and wetland habitats are also present, primarily along the valley portion of the river. While the croplands in Potter Valley do not present habitat for special-status mesocarnivores, there is some potential for these species to use the riparian corridor along the creek as a dispersal corridor between forest habitats on the mountains and hills surrounding the valley. Larger riparian trees and snags may provide resting structures for these species.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime in the river, and the majority of the river from the powerhouse to the OHWM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. As a result, riparian habitat may be reduced in some areas, but valley oaks and other trees that can tolerate seasonal flows would be expected to persist and would continue to provide cover within the riparian corridor. Some large trees may be affected by the reduction of surface water, potentially resulting in increased availability of large snags that can be used by wildlife, including special-status mesocarnivores. Therefore, implementation of the Proposed Action may affect special-status mesocarnivores in the Russian River Watershed; however, effects would be negligible.

Potential Effects to Tule Elk and Other Game Mammals

Provided below is a discussion of potential direct and indirect effects to tule elk, other game mammals, and their habitat from post-facility removal, categorized by geographic area and construction phase. The Analysis Area for tule elk and other game mammals includes (1) a 0.5-mi. buffer of the Scott Dam Area – Restoration Area and Cape Horn Dam Area – Restoration Area, (2) the Eel River from Scott Dam to the Eel River estuary, and (3) the East Branch Russian River from the Potter Valley Powerhouse to Lake Mendocino.

<u>Scott Dam Area</u>

As described above, tule elk are known to forage along the north shore of Lake Pillsbury and in the vicinity of the Gravelly Valley Landing Field (PG&E 2019a). Forests surrounding Lake Pillsbury and Scott Dam also provide suitable habitat for tule elk and a wide variety of other game mammals. Potential effects to tule elk and other game mammals from Phase 2a and Phase 2b activities are further described below.

Phase 2a

As described above, Phase 2a includes the initial temporary physical conditions in the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury, immediately following facility removal. Potential direct effects to tule elk and other game mammals from Phase 2a activities include disturbance during implementation of restoration activities and potential stranding or entrapment in eroding and exposed sediments within the reservoir beds. Potential indirect effects include alteration of riparian and wetland foraging habitats along the shoreline of Lake Pillsbury. Direct and indirect effects are described further below.

Direct Effects

Noise from ground-disturbing construction equipment and helicopter use associated with restoration activities could result in disturbance of tule elk or other game mammals foraging in the vicinity. Helicopters engaged in restoration activities may require the use of the Gravelly Valley Landing Field, where elk are known to spend time (PG&E 2019a). Based on telemetry studies from California Department of Fish and Wildlife (CDFW), the Lake Pillsbury tule elk herd mostly uses habitat along the northern shore of Lake Pillsbury (Bush et al. 2021). As described above, tule elk are relatively resilient to tolerant of helicopter use but may shift their foraging behavior and retreat to more forested parts of their habitat if helicopter use is frequent. To protect tule elk and other game mammals during active restoration activities, PG&E will implement General Restoration Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Restoration Measures, which require work to stop if wildlife is present that may be negatively impacted by restoration activities. Work will not be resumed until the animal(s) has moved out of harm's way. Refer to Section 2.2, Table 2-16, for additional details of these restoration measures. With the implementation of these measures, effects would be reduced, but activities under the Restoration Plan and Sediment/Channel Monitoring and Response plan may require multiple years of work; therefore, noise disturbance to tule elk from active restoration activities would be an adverse effect.

Conditions within Lake Pillsbury immediately following dam removal could present a risk for elk or other game mammals foraging in the area. For example, rapid drawdown of water and movement of sediments following removal of the adit plug could result in destabilization of the reservoir shoreline, resulting in collapse of the shoreline or landslides. Rapid downcutting and erosion of sediments could also result in steep and unstable slopes along the channel of the Eel River and other tributaries within the reservoir bed. The depth of channel downcutting is expected to be greatest, and occur most rapidly, in the lower portion of Lake Pillsbury, where the sediment texture is relatively fine-grained and the deposit depths are generally thickest (refer to Section 3.4.1.8, Geomorphology, for more detailed information). These conditions pose a risk for falling and entrapment of animals.

Dam removal will also result in large areas of exposed sediments throughout the reservoir. U.S. Geological Survey studies indicate that the upper reaches of the reservoir are characterized by deposits of relatively coarse sediment deposits 9 to 18 ft. thick while the downstream portion of the reservoir has a relatively uniform 3- to 5-ft.-thick deposit of predominantly silt and clay (Porterfield and Dunnam 1964, as cited in Geosyntec 2020). Deer were observed trapped in the dewatered Iron Gate Reservoir associated with the Klamath project, presumably as they attempted to reach water sources (Howard 2024). There is, therefore, some potential for tule elk or other large game mammals to sink into and become entrapped in exposed sediments, leading to injury or mortality.

Following removal of Scott Dam, significant shoreline erosion within the former reservoir bed of Lake Pillsbury is not expected to occur because the slow and controlled drawdown during Phase 1 to the 1,861.7-ft. reservoir elevation level matches the typical minimum reservoir storage level PG&E uses to avoid bank failure. As described above under Phase 1, drawdown rates of 1 and 2 ft. per day are proposed, consistent with the U.S. Society on Dams' *Guidelines for Dam Decommissioning Projects* (USSD 2015). Therefore, once the adit plug is removed, the rapid dewatering is not expected to create significant erosion in areas exposed by the drawdown. In addition, noise disturbance from restoration activities in the former reservoir bed, particularly helicopter use, may discourage tule elk or other game mammals from attempting to cross the exposed reservoir bed while active restoration activities are being implemented. However, the risk to tule elk and other game mammals from post-removal sediment instability and exposed sediments remains.

To address and reduce the potential for adverse effects to tule elk and other game mammals following removal of Scott Dam, PG&E will implement the Wildlife Stranding Measure, which requires consultation with resource agencies on the best methods to identify high-risk areas and installation of wildlife deterrents and/or protective barriers to prevent stranding in unstable areas or where deep sediment is exposed. With the implementation of these measures, potential direct effects to tule elk and other game mammals from injury, burial, or stranding would be reduced. However, considering that reservoir bed conditions during the first several years following dam removal are uncertain and may change frequently and rapidly depending on weather and other factors, and considering the difficulties inherent in excluding tule elk or other game mammals from large areas following removal of the dam, there is some potential for adverse effects to elk or other game mammals.

Indirect Effects

Suitable upland and riparian foraging habitats are present along the shoreline of Lake Pillsbury. Based on studies conducted by PG&E in 2018, these intermittently inundated areas support a wide variety of species that tule elk are known to forage on, including, but not limited to, filarees (*Erodium* spp.), smooth cat's ear (*Hypochaeris glabra*), Parish's spike rush (*Eleocharis parishii*), and curly dock (*Rumex crispus*). In addition, tule elk were observed foraging on floating pondweed (*Potamogeton natans*). Of these, Parish's spike rush was the most abundant species and was present in March, July, and September. Living Parish's spike rush forage followed the waterline, with higher elevations drying out first, appearing dependent on water input from Lake Pillsbury (PG&E 2019a).

Historically, the extent and condition of the shoreline habitats used by foraging tule elk have fluctuated but have generally persisted during drawdown of the reservoir or drought. These foraging habitats are, therefore, expected to persist in the first year or longer following dam removal. Similarly, other riparian and upland foraging habitats may exhibit localized changes (e.g., from shoreline erosion) immediately following dam removal but are expected to persist in the near-term.

PG&E will implement the Restoration Plan to restore native riparian and wetland habitats along the Eel River and tributary streams within the former reservoir bed. Refer to Section 2.2 for more details on the goals of the Restoration Plan. In the short term, before habitats recover, there may be a reduction in the total availability of riparian and wetland foraging habitats for tule elk and other game mammals. However, tule elk are able to forage in a wide variety of habitats and are expected to use other areas while riparian vegetation recovers through the course of restoration. The length of vegetation recovery may vary based on the substrate. For example, following dam removal on the Elwha River system, rapid revegetation occurred on fine sediments within a 3- to 5-year monitoring period following removal of two dams, including the development of alder, cottonwood, and willow thickets within the former reservoir beds (Shafroth et al. 2024). However, areas with coarser sediments revegetated more slowly (Shafroth et al. 2024).

PG&E would implement the Tule Elk Management Plan to monitor tule elk habitat use in the Scott Dam Area following dam removal and during restoration. With implementation of the Tule Elk Management Plan, any effects to tule elk and other game mammals from alteration of foraging habitat on the shoreline of Lake Pillsbury would be short-term and negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Scott Dam Area, including the restoration area and the bed of Lake Pillsbury. Under Phase 2b, restoration of the dam and ancillary/recreation facility sites would result in a long-term benefit to tule elk and other game mammals.

Over time, the former reservoir bed of Lake Pillsbury is expected to recolonize with riparian, wetland, and upland vegetation and return to a riverine system. To further enhance this succession process, PG&E will implement the Restoration Plan, which would enhance the connectivity of the Eel River and tributary streams within the former reservoir bed and would enhance natural vegetation recruitment processes within the former reservoir bed. In the long term, the conversion of lacustrine habitat within Lake Pillsbury to a mosaic of wetland, riparian, and upland habitats found along a restored riverine channel would increase the diversity and health of riparian and wetland ecosystems, which is expected to benefit foraging habitat for tule elk and other game mammals in the long term. Furthermore, implementation of the Restoration Plan would increase the amount of riparian habitats within the former reservoir bed compared to the existing condition in which riparian habitat is mostly restricted to the tributary streams along the shoreline.

Additionally, developed recreation and ancillary facilities would be restored to native upland habitats and human disturbance pressure would be reduced on the landscape. Therefore, implementation of the Proposed Action, including the Restoration Plan, would have beneficial effects to tule elk and other game mammals over the long term. Refer to Section 2.2 for more details on the goals of the Restoration Plan.

Cape Horn Dam Area

As described above for construction effects, tule elk are not known to occur near Cape Horn Dam. However, the Cape Horn Dam Area provides suitable habitat for a variety of game mammals. Potential effects to game mammals from Phase 2a and Phase 2b activities are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir, immediately following facility removal. Potential direct effects to tule elk and other game mammals from Phase 2a activities include disturbance during implementation of restoration activities and potential stranding or entrapment in eroding and exposed sediments within the reservoir beds. Potential indirect effects include alteration of riparian and wetland foraging habitats along the shoreline of the reservoir.

Direct Effects

As described above, noise from ground-disturbing equipment and helicopter use during restoration could result in disturbance effects to game mammals. Game mammals may be temporarily flushed or change their foraging patterns in response to human noise. However, these effects are expected to be short-term and temporary (restricted to the restoration period), and therefore, disturbance effects to other game mammals from construction activities would be negligible.

Exposure of sediments and erosion following dam removal would be minimal in the former Van Arsdale Reservoir bed for several reasons. Following removal of Cape Horn Dam, sediment would be eroded by fluvial processes until pre-dam elevations have been attained. While no sediment modeling has been conducted, several factors indicate that the process of sediment erosion from Van Arsdale Reservoir will be different from that of Lake Pillsbury. Van Arsdale Reservoir has no visible fine sediments but, rather, a stream channel bed composed of gravel, cobble, and boulders (Geosyntec 2000). The volume and depth of impounded sediment are far lower than in Lake Pillsbury. Additionally, the valley width is much narrower than in Lake Pillsbury, which will limit or preclude the channel from extensively migrating into and eroding lateral deposits as it downcuts to the pre-dam elevations. Sediment releases during high flows following removal of Scott Dam would result in some deposition of coarse sediments in the former Van Arsdale Reservoir, but the majority of sediment is expected to be transported farther downstream. Considering these factors, the potential for injury or death of game mammals from stranding or burial in the reservoir bed following dam removal is minimal. To further address and reduce this potential effect, PG&E will implement the Wildlife Stranding Measure, includes consultation with resource agencies and develop appropriate deterrents to avoid stranding, if necessary. Considering that post-dam removal conditions in the Van Arsdale Reservoir bed will pose less risk for stranding of wildlife, and with the implementation of the above measure, direct effects from stranding would be negligible.

Indirect Effects

Van Arsdale Reservoir supports forested wetlands, as well as several small emergent wetlands, within the confines of the relatively narrow valley, which may provide foraging habitat for tule elk and other game mammals. Under Phase 2a, following drawdown of Lake Pillsbury and Van Arsdale Reservoir and removal of the dams, water levels would be similar to the historic condition (i.e., confined within the historic Eel River channel). The first high-flow event would mobilize coarse sediments from Van Arsdale Reservoir downstream at the same time that millions of cubic yards of fine and coarse sediment from the former Lake Pillsbury would be mobilized. Aggradation of sediment is likely within portions of the reservoir bed, and new bars may form that promote increased bank erosion and lateral channels. The nature of the changes will vary depending on the width and slope of any given portion of the reservoir bed. While sediment releases could result in minor reductions in the extent of forested and emergent wetlands because of reduced water levels or from burial in sediment, new riparian vegetation may also become established on new depositional surfaces (Shafroth et al. 2002, 2024). A 2024 review of several studies on the Elwha River system noted that new surfaces within the former reservoirs were rapidly colonized, particularly in areas of fine sediment, within 3 to 5 years after dam removal (Shafroth et al. 2024). Additionally, sediments trapped behind Scott Dam upstream may also contain seed sources that could facilitate rapid colonization within Van Arsdale Reservoir, as was observed downstream of the Glines Canyon Dam in the Elwha River system (Shafroth et al. 2024). Therefore, effects to tule elk and other game mammals resulting from minor changes in riparian and wetland foraging habitat in the Cape Horn Dam Area would be negligible.

Phase 2b

Phase 2b is the resulting conditions following restoration of the Cape Horn Dam Area, including the restoration area and the bed of Van Arsdale Reservoir.

As described above, the implementation of the Restoration Plan would enhance natural vegetation recruitment processes within the former Van Arsdale Reservoir bed. The reach of the Eel River currently buried under sediment impounded by Cape Horn Dam is expected to return to a morphologic condition similar to pre-dam conditions and as described for the upstream reach nearer Scott Dam (refer to Section 3.4.1.8). Similar to the patterns observed following dam removal in the Elwha River system (Shafroth et al. 2024), the river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less-dense riparian vegetation. In other areas, the formation of new sediment bars may provide surfaces for the establishment of young riparian vegetation (Shafroth et al. 2002, 2024). The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events. While the density of mature riparian vegetation decreased, increased diversity of riparian species and age class structure was observed within 4 to 5 years following dam removal on the Elwha River system (Shafroth et al. 2024). Over time, the restored river channel will be part of a broader mosaic of native habitat for tule elk and other game mammals. Therefore, in the long term, implementation of the Proposed Action, including the Restoration Plan, would benefit tule elk and other game mammals.

Eel River Watershed

Potential effects to tule elk and other game mammals from Phase 2a and Phase 2b activities in the Eel River Watershed are further described below.

Phase 2a

Phase 2a includes the initial temporary physical conditions in the Eel River Watershed immediately following facility removal. This includes the approximate 12-mi. section of the Eel River from Scott Dam to Van Arsdale Reservoir, the 38-mi. section of the Eel River below Cape Horn Dam to the Middle Fork Eel River, and the 119-mi. section from the Middle Fork Eel River to the estuary. Restoration activities are limited to the Scott Dam and Cape Horn Dam restoration areas and will not directly affect species in the Eel River Watershed.

Direct Effects

Release and aggradation of sediments downstream of Scott Dam could potentially increase the risk for burial or entrapment of elk or large game mammals. The duration of erosion of upstream sediment during the initial high-flow event following dam removal was estimated to take from 1 to 8 days depending on the rate of discharge. Based on sediment transport modeling of the Proposed Action (refer to Section 3.4.1.8), it is expected that the majority of coarse sediment will be deposited prior to the confluence with the Middle Fork Eel River. In addition, some of the suspended fine sediment may deposit and alter channel or floodplain morphology in this reach, at least temporarily until subsequent high-flow events can resuspend it and transport it farther downstream. While the risk of mammal stranding is reduced in the Eel River as compared to Lake Pillsbury, some risk remains, but direct effects would be considered negligible.

Indirect Effects

Tule elk and other game mammals may potentially forage in riparian and wetland habitats along the Eel River. The effects of sediment release on riparian vegetation present along the Eel River would vary based on site-specific factors including volume of discharge, distance from the point of release, and the geomorphology of the site affected. Deposition of sediment closest to the former dam sites could result in temporary burial of vegetation, particularly low-lying shrubs and herbaceous vegetation in proximity to the river channel. In the Ewha River system, sediment burial did not have measurable effects on the amount of mature riparian vegetation downstream of the removed dams within a 3- to 5-year monitoring period (Shafroth et al. 2024). Effects to riparian habitat would occur primarily in the reach from Scott Dam downstream to the confluence with the Middle Fork Eel River. Sediment deposition is expected to decrease with distance and is expected to have a minimal effect downstream of the Middle Fork Eel River and therefore would not result in detectable changes in associated riparian or estuarine habitats in this reach. Temporary effects to riparian and wetland habitats along the Eel River from Scott Dam to the Middle Fork Eel River would have a negligible effect on foraging habitats for game mammals.

Phase 2b

From Scott Dam downstream to the Middle Fork Eel River, the Proposed Action is expected to result in a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, and deeper pools. Areas with existing overly dense riparian vegetation will be scoured more frequently or buried with sediment deposits, resulting in less-dense vegetation. In the Elwha River system, large patches of stable, mature riparian vegetation in the reach between two dams were scoured, and new channel bars formed that allowed the establishment of early successional species (Shafroth et al. 2024). In other areas, the formation of new sediment bars may provide surfaces for establishment of young riparian vegetation (Shafroth et al. 2002, 2024). In the long term, the riparian community, diversity, age class structure, and composition are expected to increase under the unimpaired hydrology, resulting in more complex and diverse riparian communities. For example, within 3 to 5 years following monitoring on the Elwha River system, native species diversity on the Elwha River reach between the two former dams increased by 31 percent after dam removal (Shafroth et al. 2024).

The Proposed Action would have minimal effects to river morphology downstream of the Middle Fork Eel River and is not likely to result in detectable long-term changes in associated riparian and estuarine habitats.

Restoration of unimpaired river flow conditions, and associated variable effects on riparian habitat, would have a minor, neutral, or beneficial effect on tule elk and other game mammals.

Russian River Watershed

Under existing conditions, PG&E diverts water from the Potter Valley Powerhouse into the 11-mi. East Branch Russian River, which runs from the powerhouse, through an alluvial valley (i.e., Potter Valley), and up through more mountainous terrain to Lake Mendocino, formed where the East Branch meets the mainstem Russian River. Diversions into the East Branch Russian River, based on monthly average, typically ranged between about 150 cfs to 225 cfs, with maximum flows of about 300 cfs for the period of record (see Section 3.3.1), although in recent years they have been much lower (see Figure 3.3.1-15). Since 1908, diversions from the Eel River have been used to irrigate a wide variety of croplands in Potter Valley including, but not limited to, irrigated pasture, hayfields, pears, vineyards, and other row crops (Potter Valley Irrigation District 2024). Riparian and wetland habitats are also present, primarily along the valley portion of the river. Cropland, riparian, and wetland habitats may also provide foraging habitat for tule elk and other game mammals. Tule elk, specifically, are known to forage in irrigated hayfields and pastures in Potter Valley.

Following removal of Cape Horn Dam under Phase 2a, PG&E would no longer divert water to the Potter Valley Powerhouse. Re-establishment of unimpaired flows in the East Branch Russian River would result in an intermittent flow regime in the river, and the majority of the river from the powerhouse to the OHWM of Lake Mendocino (approximately 11 mi.) would be seasonally dry. This would result in an alteration in the location and extent of riparian and wetland habitats, and the reduction or loss of irrigation water is likely to result in the loss of irrigated croplands. Upland habitats and dryland crops that are more tolerant of drier seasonal conditions would become more prevalent in the valley. Changes in the location and extent of riparian and wetland habitats, the potential loss of croplands, and the increase in upland habitats that may provide fewer foraging options may reduce foraging habitat for tule elk and other game mammals over the long term. Therefore, there may be adverse effects to tule elk and other game mammals that depend on riparian, wetland, and irrigated agricultural habitats along the East Branch Russian River.

Dam Removal Sequencing Options

If the Scott Dam adit were removed and sediment flushed in the year prior to the removal of Cape Horn Dam, sediment released from Scott Dam would settle into Van Arsdale Reservoir. Prior to Cape Horn Dam removal, this material would be removed and stockpiled within the construction areas. As compared to the Proposed Action, this option would result in a longer construction period, a potential increase in turbidity in the construction areas, and the potential for spread or introduction of invasive weeds that may become established on stockpiled material. Implementation of this option would result in longer disturbance of breeding and foraging wildlife species and increased degradation of terrestrial habitats from the spread or introduction of invasive weeds. With the implementation of the measures described in Section 2.2, Table 2-14, implementation of this option would have a greater effect on wildlife resources.

If Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam, sediment would be released twice—once following removal of Cape Horn Dam and following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (see Section 2.2.2 for a description of the pump station). Similar to the previous option, implementation of this option would likely result in longer disturbance of breeding and foraging wildlife species and increased degradation of terrestrial habitats from the potential spread or introduction of invasive weeds during sediment removal activities, if needed. With the implementation of the measures described in Section 2.2, Table 2-14, implementation of this option would have a greater effect on wildlife resources.

Construction and Environmental Measures

To avoid or reduce effects to wildlife resources during construction, PG&E will obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- General Construction Measures
- Invasive Weed Construction Measures
- General Wildlife Measures
- Riparian and Wetland Protection Measures
- Bald Eagle Conservation Plan
- Northern Spotted Owl Management Plan
- Other Raptor Construction Measures (including Osprey Measure, American Peregrine Falcon Measure, and Other Raptors Measure)

- Other Special-status Birds and Game Birds Construction Measures
- Special-status Bats Construction Measures
- Special-status Mesocarnivores Construction Measures

To reduce potential effects to wildlife resources post-facility removal (Phase 2), PG&E will implement the following post-facility removal measures. A complete list of environmental measures is included in Section 2.2.3.

- General Restoration Measures
- Restoration Plan
- Invasive Weed Restoration Measures
- General Wildlife Restoration Measures
- Wildlife Stranding Measure
- Bald Eagle Conservation Plan
- Northern Spotted Owl Management Plan
- Other Raptor Restoration Measures (including Osprey Measure, American Peregrine Falcon Measure, and Other Raptors Measure)
- Other Special-status Birds and Game Birds Restoration Measures
- Special-status Mesocarnivores Restoration Measures
- Tule Elk Management Plan

Unavoidable Adverse Effects

The following unavoidable adverse effects to wildlife resources are described below and organized by species.

- Bald Eagle
  - Potential nest abandonment at Scott Dam and Cape Horn Dam from the noise of construction activities (Phase 1)
  - Reduction in foraging habitat quality at Cape Horn Dam from construction activities (Phase 1)
  - Potential nest territory abandonment from loss of Lake Pillsbury following facility removal (Phase 2a)
  - Potential nest territory abandonment from changes to foraging habitat in Van Arsdale Reservoir following facility removal (Phase 2a)
  - Adverse effects to fish prey resources from the release of sediments into the Eel River following dam removal (Phase 2a)

- Northern Spotted Owl
  - Potential nest abandonment in the Scott Dam Area from construction activities (Phase 1)
- Other Raptors
  - Potential nest abandonment at Scott Dam and Cape Horn Dam from the noise of construction activities (Phase 1)
  - Alteration of osprey foraging habitat from the loss of Lake Pillsbury following Scott Dam removal (Phase 2a)
  - Adverse effects to fish prey resources for osprey from the release of sediments into the Eel River following dam removal (Phase 2a)
  - Alteration of aquatic foraging habitat for osprey in the East Branch Russian River following Cape Horn Dam removal because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2b)
- Other Special-status Birds or Game Birds
  - Loss of lacustrine foraging habitat for waterfowl from loss of Lake Pillsbury following facility removal (Phase 2a)
  - Alteration of aquatic, riparian, wetland, and agricultural nesting and foraging habitat for tricolored blackbird along the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2b)
- Mesocarnivores
  - Potential disturbance to dens from construction or restoration activities (Phases 1 and 2b)
- Tule Elk and Other Game Mammals
  - Potential shifts in behavior resulting from noise disturbance during implementation of restoration activities in the former reservoir bed of Lake Pillsbury (Phase 2a)
  - Potential stranding in exposed sediments within the former Lake Pillsbury and in the Eel River immediately downstream of the dams (Phase 2a)
  - Alteration of riparian, wetland, and agricultural foraging habitat in the East Branch Russian River because diversions to the East Branch Russian River would no longer occur under the Proposed Action (Phase 2b)

References

Airola, D., and J.A. Estep. 2022. Habitat use and reproductive success of ospreys in central interior California. California Fish and Wildlife Journal 108: e7.

Anderson, B.A. 2007. A Literature Review of the Effects of Helicopter Disturbance and Noise on Selected Wildlife Species.

Anderson, A. 2024. E-mail communications from Andrew Anderson, PG&E biologist, to Robyn Smith of JNA-Consulting providing information on bat roosts at Project facilities. October 16, 2024.

Brown, C.L., A.R. Rardy, J.R. Barber, K.M. Fristrup, K.R. Crooks, and L.M. Angeloni. 2012. The Effect of Human Activities and Their Associated Noise on Ungulate Behavior. M. Hayward, editor. PLoS ONE 7(7): e40505. DOI: 10.1371/journal.pone.0040505.

Brown, W., and J. Ritter. 1971. Sediment transport and turbidity in the Eel River basin, California. U.S. Geological Survey Water-Supply Paper 1986.

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In The Birds of North America, No. 506 (A. Poole and F. Gill, editors). The Birds of North America, Inc., Philadelphia, PA.

Bush, J., T. Batter, R. Landers, and K. Denryter. 2021. Report of aerial surveys of tule elk (*Cervus canadensis nannodes*) in 2018–2019 in Bear Valley, Cache Creek, East Park, and Lake Pillsbury Tule Elk Hunt Zones. California Department of Fish and Wildlife, January 2021.

Calflora. 2024. Information on California plants for education, research and conservation. [web application]. Berkeley, California: The Calflora Database [a non-profit organization]. Available: http://www.calflora.org/.

CNDDB (California Natural Diversity Database). 2024. RareFind5 (Internet), Version 5.3.0. California Department of Fish and Wildlife.

Duda, J.J., C.E. Torgersen, S.J. Brenkman, R.J. Peters, K.T. Sutton, H.A. Connor, P Kennedy, S.C. Corbett, E.Z. Welty, A. Geffre, P. Crain, D. Shreffler, J.R. McMillan, M. McHenry, and G.R. Pess. 2021. Reconnecting the Elwha River: Spatial Patterns of Fish Response to Dam Removal. Frontiers in Ecology and Evolution 9: 765488. DOI: 10.3389/fevo.2021.765488.

FERC (Federal Energy Regulatory Commission). 2022. Final environmental impact statement for hydropower license surrender and decommissioning of the Lower Klamath Project—FERC Project No. 14803-001 Klamath Hydroelectric Project—FERC Project No. 2082-063, Oregon and California.

Forsman, E.D., E.C. Meslow, and H.M. Wright. 1984. Distribution and biology of the spotted owl in Oregon. Wildlife Monographs 87: 3–64.

Geosyntec. 2020. Sediment investigation report – Lake Pillsbury and Van Arsdale Reservoir, Northern California. Prepared for California State Coastal Conservancy.

Golet, G., D. Brown, M. Carlson, T. Gardali, A. Henderson, K. Holl, C. Howell, M. Holyoak, J. Hunt, M. Kondolf, E.W. Larsen, R.A. Luster, C. McClain, C. Nelson, S. Paine, W. Rainey, Z. Rubin, F. Shilling, J. Silveira, H. Swagerty, N.M. Williams, and D.M. Wood 2013. Successes, Failures and Suggested Future Directions for Ecosystem Restoration of the Middle Sacramento River, California. San Francisco Estuary and Watershed Science 11(3). DOI: 10.15447/sfews.2013v11iss3art11.

Grubb, T.G., and R.M. King. 1991. Assessing Human Disturbance of Breeding Bald Eagles with Classification Tree Models. The Journal of Wildlife Management 55(3): 500. DOI: 10.2307/3808982.

Harmata, P.J., M. Restani, and A.R. Harmata. 2007. Settlement patterns, foraging behavior, and reproductive success of ospreys along a heterogeneous riverine corridor. Canadian Journal of Zoology 85: 56–62.

Hayward, L.S., A.E. Bowles, J.C. Ha, and S.K. Wasser. 2011. Impacts of acute and long-term vehicle exposure on physiology and reproductive success of the northern spotted owl. Ecosphere 2(6): Article 65.

Holthuijzen, A.M.A., W.G. Eastland, A.R. Ansell, M.N. Kochert, R.D. Williams, and L.S. Young. 1990. Effects of Blasting on Behavior and Productivity of Nesting Prairie Falcons. Wildlife Society Bulletin (1973–2006) 18(3): 270–281.

Howard, J. 2024. Hornbrook Fire Dept. readies for animal rescues at Iron Gate Reservoir, with ten deer dead. KDRV.com. Available at: https://www.kdrv.com/news/local/hornbrook-fire-dept-readies-for-animal-rescues-at-iron-gate-reservoir-with-ten-deer-dead/article_80bfaeec-c082-11ee-9828-57a0cac18ba4.html.

Irwin, L.L., D.F. Rock, and S.C. Rock. 2013. Do northern spotted owls use harvested areas? Forest Ecology and Management 310: 1,029–1,035. DOI: 10.1016/j.foreco.2013.04.001.

Jackman, R.E., and J.M. Jenkins. 2004. Protocol for Evaluating Bald Eagle Habitat and Populations in California. June 2004.

Jackman, R.E., W.G. Hunt, and N.L. Hutchins. 2007. Bald Eagle Foraging and Reservoir Management in Northern California. Journal of Raptor Research 41(3): 202–211.

Kuck, L., G.L. Hompland, and E.H. Merrill. 1985. Elk Calf Response to Simulated Mine Disturbance in Southeast Idaho. The Journal of Wildlife Management 49(3): 751. DOI: 10.2307/3801706.

Lisle, T.E. 1990. The Eel River, Northwestern California: high sediment yields from a dynamic landscape. In Surface Water Hydrology, v. O-1. The Geology of North America, M.G. Wolman and H.G. Riggs, editors, pp. 311–314. Geological Society of America.

Martin, M.M. 2011. Spatial behaviour and habitat use by elk (*Cervus elaphus*) in response to highway construction and interprovincial relocation. School of Graduate Studies, Laurentian University. Master's Thesis.

McDonald, T.L., B.F.J. Manly, R.M. Nielson, L.V. Diller. 2010. Discrete-choice modeling in wildlife studies exemplified by northern spotted owl nighttime habitat selection. Journal of Wildlife Management 70(2): 375–383.

McMillen Jacobs Associates. 2021. Scott Dam and Cape Horn Dam removal alternatives. Prepared for Two-Basin Solution Partners.

Morrison, M.L., R.J. Young, J.S. Romsos, and R. Golightly. 2011. Restoring Forest Raptors: Influence of Human Disturbance and Forest Condition on Northern Goshawks. Restoration Ecology 19(2): 273–279.

NMFS (National Marine Fisheries Service). 2002. Biological opinion for the proposed license amendment for the Potter Valley Project (Federal Energy Regulatory Commission Project Number 77-110). NMFS Southwest Region. November 26.

Olsson, M.P.O., J. Cox, J. Larkin, D. Maehr, P. Widen, and M. Wichrowski. 2007. Movement and Activity Patterns of Translocated Elk (*Cervus elaphus nelsoni*) on an Active Coal Mine in Kentucky. Wildlife Biology in Practice 3(1): 33. DOI: 10.2461/wbp.2007.3.1.

Orr, C.H., S.J. Kroiss, K.L. Rogers, and E.H. Stanley. 2008. Downstream benthic responses to small dam removal in a coldwater stream. River Research and Applications 24: 804–822.

PG&E (Pacific Gas and Electric Company). 2019a. TERR 2 – Wildlife Resources Study Data Memorialization, Technical Study Summary. Potter Valley Project (FERC Project No. 77 Relicensing).

PG&E (Pacific Gas and Electric Company). 2019b. TERR 1 – Botanical Resources Study Data Memorialization, Technical Study Summary. Potter Valley Project (FERC Project No. 77 Relicensing).

PG&E (Pacific Gas and Electric Company). 2019c. Final Potter Valley Project 2014–2019 Bald Eagle Monitoring Report.

PG&E (Pacific Gas and Electric Company). 2004. Bald Eagle Management Plan Addressing License Article 54. Potter Valley Hydroelectric Project, FERC Project No. 77. June 2004.

PG&E (Pacific Gas and Electric Company). 2006. Van Arsdale Reservoir bathymetric survey, Technical, and Land Services.

PG&E (Pacific Gas and Electric Company). 2021. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2021.

PG&E (Pacific Gas and Electric Company). 2022. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2022.

Porterfield, G., and C. Dunnam. 1964. Sedimentation of Lake Pillsbury, Lake County, California. Geological Survey Water-Supply Paper 1619-EE. April.

Potter Valley Irrigation District. 2024. Potter Valley Agriculture. Available at: https://www.pottervalleywater.org/pvid_agriculture.html

Reid, S.M., and P.G. Anderson. 2000. Effects of sediment released during open-cut pipeline water crossings. Hydrobiologia 79: 271–276.

Shafroth, P.B., J.M. Friedman, G.T. Auble, M.L. Scott, and J.H. Braatne. 2002. Potential responses of riparian vegetation to dam removal. BioScience 52: 703–712.

Shafroth, P.B., L.G. Perry, J.M. Helfield, J. Chenoweth, and R.L. Brown. 2024. Vegetation responses to large dam removal on the Elwha River, Washington, USA. Frontiers in Ecology and the Environment 12:1272921. doi: 10.3389/fevo.2024.1272921.

Slauson, K.M., W.J. Zielinski, and M.J. Schwartz. 2016. Ski areas affect Pacific marten movement, habitat use, and density. Journal of Wildlife Management 81(5): 892–904.

Spaul, R.J., and J.A. Heath. 2017. Flushing Responses of Golden Eagles (*Aquila chrysaetos*) in Response to Recreation. The Wilson Journal of Ornithology 129(4): 834–845.

Stillwater Sciences. 2021a. Analyses and preliminary modeling of sediment transport following the proposed Scott Dam removal, Eel River, California. Technical Memorandum. Prepared for Two-Basin Solution Partners. November.

Stillwater Sciences. 2021b. Analyses of fine sediment erosion following the proposed Scott Dam removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

Swarthout, E.C.H., and R.J. Steidl. 2003. Experimental effects of hiking on breeding Mexican spotted owls. Conservation Biology 17(1): 307–315.

Tempel, D.J., and R.J. Gutiérrez. 2004. Factors related to fecal corticosterone levels in California spotted owls: implications for assessing chronic stress. Conservation Biology 18(2): 538–547.

USFS (U.S. Forest Service). 2016. Mendocino National Forest wildlife GIS layers. Received March 2016.

USFS (U.S. Forest Service). 2020. Programmatic Biological Assessment for the Southern Sierra Nevada DPS of Pacific Fisher. USFS, Pacific Southwest Region. May 19, 2020.

USFS (U.S. Forest Service). 2024. Forest Planning and Monitoring Datasets. Northwest Forest Plan Region 5 Geospatial Data Portal. Website accessed May 2024. Available at: http://www.fs.usda.gov/detail/r5/landmanagement/gis/?cid=STELPRDB5327165.

USFWS (U.S. Fish and Wildlife Service). 2006. Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California. USFWS, Arcata Fish and Wildlife Office, Arcata, CA.

USFWS (U.S. Fish and Wildlife Service). 2007. National Bald Eagle Management Guidelines.

USFWS (U.S. Fish and Wildlife Service). 2012. Endangered and threatened wildlife and plants; designation of revised critical habitat for the northern spotted owl. Final rule. 50 CFR Part 17 (FWS-R1-ES-2011-0012). Available at: http://www.regulations.gov.

USSD (U.S. Society on Dams). 2015. Guidelines for dam decommissioning projects. Prepared by the USSD Committee on Dam Decommissioning.

Verner, J., K.S. McKelvey, B.R. Noon, R.J. Gutierrez, G.I. Gould Jr., and T.W. Beck. 1992. The California Spotted Owl: A technical assessment of its current status. USDA Forest Service Gen. Tech. Rep. PSW-GTR-133.

Walters, K.E., J.D. Reynolds, and R.C. Ydenberg. 2021. Ideal free eagles: bald eagle (*Haliaeetus leucocephalus*) distribution in relation to Pacific salmon (*Oncorhynchus* spp.) availability on four spawning rivers. Canadian Journal of Zoology 99(9): 792–800.

Wasser, S.K., K. Bevis, G. King, and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the northern spotted owl. Conservation Biology 11: 1,019–1,022.

Wengert, G.M. 2013. Ecology of Intraguild Predation on Fishers (*Martes pennanti*) in California. PhD Thesis, University of California, Davis.

White, C.M., and S.K. Sherrod. 1973. Advantages and Disadvantages of the Use of Rotor-Winged Aircraft in Raptor Surveys. Journal of Raptor Research 7 (3/4): 97–104.

Wisdom, M.J., H.K. Preisler, L.M. Naylor, R.G. Anthony, B.K. Johnson, and M.M. Rowland. 2018. Elk responses to trail-based recreation on public forests. Forest Ecology and Management 411: 223–233.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

BMP	best management practice
cfs	cubic foot/feet per second
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
SPCC	Spill Prevention, Control, and Countermeasures

This Page Intentionally Left Blank

3.4.1.7 Geology and Soils

This section describes the potential effects on geology and soils, including groundwater, that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. The information presented in Section 2.2 includes a description of PG&E's decommissioning activities, including the removal of Project facilities and post-removal restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction and deconstruction effects (Phase 1) and post-facility removal effects (Phase 2). Post-facility removal effects are split into two subphases: Phase 2a – Initial Condition and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration. Refer to Section 3.4.1.1 for a description of each phase.

Effects were determined by analyzing the potential changes to geology and soils, including groundwater, that could result from activities to be implemented under the Proposed Action (Section 2.2) as compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Effects of the Proposed Action to geomorphic processes and form that could occur during deconstruction (i.e., removal) of the Project dams and associated facilities and removal of Project recreation facilities (Phase 1) and to sediment transport and the geomorphic response of the Eel River and its tributaries to the removal of the dams (Phase 2) are presented in Section 3.4.1.8, Geomorphology, and are not discussed in this section.

Phase 1: Short-term Construction Effects

This section discusses potential short-term effects to geology and soils that could occur during deconstruction and removal of the Project dams and associated facilities and removal of the Project recreation facilities in the Scott Dam (Lake Pillsbury) Area, Cape Horn Dam (Van Arsdale) Area, and Eel River Watershed.

Scott Dam Area

Under Phase 1 of the Proposed Action, several temporary construction access roads and staging areas would be constructed. Lake Pillsbury would be dewatered, and Scott Dam would be removed. In addition, all the Project recreation facilities surrounding Lake Pillsbury and all associated features (e.g., facility access roads, water supply wells, water distribution lines, etc.) would be removed. The following potential effects to geology and soils resulting from construction activities associated with removal of Scott Dam and associated facilities, and Project recreation facilities and features, were analyzed:

- Construction activities could cause soil erosion, which could increase sedimentation and turbidity in the Eel River.
- Accidental spill of fuels or other toxic materials could cause soil contamination.
- Construction activities associated with removal of the dam could activate known landslides located in the immediate vicinity of the dam.
- Dewatering of Lake Pillsbury as the dam is removed could result in unstable slopes along the shoreline, which could lead to slope failure and increased sedimentation.
- Dewatering of Lake Pillsbury as the dam is removed would expose previously submerged slopes, increasing the likelihood of soil erosion.

These potential effects are discussed further in the following subsections.

Construction-related Soil Erosion

Under the Proposed Action, temporary construction access roads and staging areas would be constructed to facilitate removal of Scott Dam and certain Project recreation facilities. Construction and grading of the temporary access roads and staging areas and facility removal would involve the use of heavy equipment and ground-disturbing activities that have a high likelihood of causing erosion, especially along any unpaved temporary access routes and in areas dominated by unconsolidated Quaternary sediments.

Erosion from the construction areas and the resulting runoff could temporarily impact water quality in the Eel River upstream and downstream of Scott Dam by increasing sedimentation and turbidity, both of which are considered adverse impacts. Accordingly, PG&E would implement a Construction Erosion Prevention Plan and best management practices (BMPs) to minimize and control soil erosion to protect water quality during construction. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for excessive soil erosion and sedimentation, and related water quality impacts are considered negligible. See Section 3.4.1.3 for analysis of water quality effects.

Potential for Soil Contamination from an Accidental Spill of Fuel or Other Toxic Materials

Construction activities associated with the removal of Scott Dam and certain Project recreation facilities would involve the use of heavy equipment, machinery, and vehicles. Soil contamination has the potential to occur from accidental spills of fuels or other materials used in heavy equipment operations during construction activities. The potential for soil contamination is considered an adverse impact. Accordingly, PG&E would implement hazardous materials handling measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan with protocols for preventing spills and managing incidents should they occur. In addition, PG&E would obtain applicable resource agency and construction permits. The potential for soil contamination from construction would be reduced to a negligible level with adherence to the SPCC Plan and construction-related BMPs.

Landslide Instability

As shown on Map 3.3.6-7, an existing landslide is located on the south side of Lake Pillsbury, immediately upstream of Scott Dam. In the past, elevated groundwater levels initiated movement of the landslide and imposed an additional load on the dam. The landslide was subsequently instrumented with inclinometers that can be remotely monitored to provide early warning of significant movement near the dam. The landslide has not shown any movement in recent years. However, construction activities associated with the removal of Scott Dam could reactivate this landslide, as discussed below.

Removal of the dam would involve significant ground disturbance from the use and storage of large, heavy construction machinery and from drilling, blasting, and cutting through the dam. The proposed South Side Dam End Staging Area may be located within the limits of a known landslide (Map 2-8). Activities associated with removal of the dam could produce significant vibrations, and if large, heavy construction equipment is stored in this area, that would increase the weight of the landslide mass, and reactivation of the landslide could occur. In addition, heavy equipment may have to travel across the landslide or be positioned within the landslide mass, which could also trigger reactivation. The sudden reactivation of this landslide could pose a significant safety risk to workers in the vicinity. In addition, reactivation of this landslide could potentially introduce a large quantity of sediment to the work area that would need to be removed or otherwise flushed downstream. The potential risk to worker safety and the potential to introduce sediment to the work area are considered significant impacts.

Although the landslide is instrumented with inclinometers and movement can be remotely monitored, the inclinometers cannot prevent reactivation of the landslide from occurring. Therefore, PG&E would develop a Scott Dam Slope Stability Monitoring Plan that would include the following measures to address and reduce the potential for reactivating the landslide and to protect worker safety:

- Remove all or a portion of the landslide material prior to initiating the removal of Scott Dam;
- Stabilize the landslide with mechanical supports such as caissons;
- If the landslide is not mitigated, prevent the use of equipment on or in the immediate vicinity of the landslide and prohibit personnel from working within the landslide flow path or occupying the landslide; and
- Develop Public Safety Measures that would identify potential public and worker safety risks and includes measures that would be implemented during construction, including locating the staging area in an area that would not be at risk.

Implementing these measures would reduce the risks associated with reactivation of this landslide to negligible levels.

Slope Instability Surrounding Lake Pillsbury

Under Phase 1 of the Proposed Action, Lake Pillsbury would be partially dewatered to facilitate the removal of Scott Dam. Slope instability around Lake Pillsbury could contribute additional sediment into the Eel River upstream of Scott Dam and its tributaries.

The west and east shorelines of Lake Pillsbury consist mainly of Quaternary sedimentary deposits, and a relatively large landslide is present along the south shore of the reservoir, near Scott Dam (Map 3.3.6-7 and Map 2-8). These Quaternary deposits appear to be generally stable. However, as the reservoir is dewatered and saturation levels in the sedimentary deposits would be reduced, the slopes surrounding Lake Pillsbury could become unstable, leading to slope failures. Large-scale slope failures would not be expected, but small-scale slope failures could occur, leading to increased sedimentation to the Eel River and its tributaries upstream of Scott Dam. The amount of sediment contributed through slope failures would not be expected to be significant compared to the amount of sediment that has already accumulated in Lake Pillsbury. Therefore, increased sedimentation from small slope failures is considered negligible compared to existing conditions. The potential for slope failure would be reduced as the once-saturated soils dry and new vegetative growth takes root.

Erosion of Slopes Surrounding Lake Pillsbury

Under the Proposed Action, water levels in Lake Pillsbury would be lowered to facilitate the removal of Scott Dam. Water surface elevations would continue to decline after the dam is removed. Without the impoundment, the denuded slopes surrounding Lake Pillsbury and the exposed reservoir bed would be susceptible to water and wind erosion, especially as the soils dry.

The geologic map of Lake Pillsbury (Map 3.3.6-7) shows older Quaternary alluvial deposits present on the slopes east and west and of Lake Pillsbury and “harder rock” that includes an ophiolitic mélange of sedimentary rocks, metasandstone, and serpentine rocks on slopes that border Lake Pillsbury on the south. Quaternary deposits on the slopes east and west of Lake Pillsbury, which would be barren as the reservoir recedes, would be more susceptible to both water and wind erosion than the “hard” rocks on slopes that border Lake Pillsbury to the south.

Significant rainfall events would likely increase rilling, gullying, and sheet flow, particularly off steep slopes. These processes would lead to increased sediment loads and turbidity in the Eel River and its tributaries upstream of Scott Dam. This situation would persist until restoration activities are implemented and new vegetation is established (discussed further under Phase 2 below). Increased sedimentation into the Eel River is considered an adverse impact. Given the extent of shoreline that would be exposed, implementing large-scale interim erosion control measures around the entire reservoir is not practical. However, to reduce the potential for erosion and sedimentation, PG&E would monitor for excessive erosion and would implement an Construction Erosion Prevention Plan that would include erosion control measures (e.g., straw waddles), where necessary. In addition, PG&E would implement a Restoration Plan as soon as practicable after dewatering begins. With these measures, the potential for slope erosion and increased sedimentation into the Eel River would be reduced to negligible levels.

The exposed, denuded slopes surrounding Lake Pillsbury would also be vulnerable to wind erosion as they dry. Wind erosion could increase airborne particulate matter and adversely impact local air quality. Air quality impacts and associated measures are discussed in Section 3.4.1.16.

Cape Horn Dam Area

Under Phase 1 of the Proposed Action, Cape Horn Dam and select associated facilities would be removed and Van Arsdale Reservoir would be dewatered. Implementation of Phase 1 of the Proposed Action could result in the following potential impacts relative to existing conditions:

- Construction activities could cause soil erosion, which could increase sedimentation and turbidity in the Eel River.
- Accidental spill of fuels or other toxic materials could cause soil contamination.
- Dewatering of Van Arsdale Reservoir would expose previously submerged slopes and reservoir bed, increasing the likelihood of soil erosion.

These potential impacts are discussed below. Given the relatively small footprint, shallow depth of the existing reservoir, and relatively gentle slopes surrounding Van Arsdale Reservoir, impacts related to slope stability are not expected.

Construction-related Soil Disturbance

Under Phase 1 of the Proposed Action, Cape Horn Dam and select associated facilities and features would be demolished and removed. The activities associated with the removal of these facilities are described in detail in Section 2.2.1.1. Demolition and removal of the existing facilities would involve the use of heavy equipment and ground-disturbing activities that have a high likelihood of causing erosion, especially along unpaved temporary access routes and in areas dominated by unconsolidated Quaternary sediments.

Erosion from the construction areas and the resulting runoff could temporarily impact water quality in the Eel River downstream of the work and staging areas by increasing sedimentation and turbidity, both of which are considered adverse impacts. Accordingly, PG&E would implement a Construction Erosion Prevention Plan and BMPs to minimize and control soil erosion to protect water quality during construction. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for excessive soil erosion, sedimentation, and related water quality impacts is considered negligible. See Section 3.4.1.3 for analysis of water quality effects.

Potential for Soil Contamination from an Accidental Spill of Fuel or Other Toxic Materials

Construction activities associated with the removal of Cape Horn Dam would involve the use of heavy equipment, machinery, and vehicles. Soil contamination has the potential to occur from accidental spills of fuels or other materials used in heavy equipment operations during construction activities. The potential for soil contamination is considered an adverse impact. Accordingly, PG&E would implement hazardous materials handling measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing an SPCC Plan with protocols for preventing spills and managing incidents should they occur. In addition, PG&E would obtain applicable resource agency and construction permits. The potential for soil contamination from construction would be reduced to a negligible level with adherence to the SPCC Plan and construction-related BMPs.

Erosion of Slopes Surrounding Van Arsdale Reservoir

Under the Proposed Action, the majority of Cape Horn Dam would be removed and the dam would no longer be capable of impounding water. Without the impoundment, the denuded slopes surrounding Van Arsdale Reservoir and the exposed reservoir bed would be susceptible to water and wind erosion, especially as the soils dry.

Significant rainfall events would likely increase rilling, gullying, and sheet flow, particularly off steep slopes. These processes would lead to increased sediment loads and turbidity in the Eel River upstream of the former Cape Horn Dam site. This situation would persist until restoration activities are implemented and new vegetation is established (discussed further under Phase 2 below). Increased sedimentation into the Eel River is considered a significant impact. Given the extent of shoreline that would be exposed, implementing large-scale interim erosion control measures around the entire reservoir would not be practical. However, to reduce the potential for erosion and sedimentation, PG&E would monitor for excessive erosion and would implement a Construction Erosion Prevention Plan that includes erosion control measures, where necessary, similar to those described above. In addition, PG&E would implement a Restoration Plan as soon as practicable after dewatering begins. With these measures, the potential for slope erosion and increased sedimentation into the Eel River would be reduced to negligible levels.

The exposed, denuded slopes surrounding the dewatered Van Arsdale Reservoir would also be vulnerable to wind erosion as they dry. Wind erosion could increase airborne particulate matter and adversely impact local air quality. Air quality impacts and associated measures are discussed in Section 3.4.1.16.

Eel River Watershed

Implementation of Phase 1 of the Proposed Action could result in the following potential impacts relative to existing conditions:

- Flows downstream of the dams during construction and dewatering of the reservoirs could result in erosion of the streambanks downstream of the dams.

Streambank Erosion

The streambanks along the Eel River mostly consist of unconsolidated, erodible sediments that are prone to erosion. As shown on Map 3.3.6-7, the Eel River corridor downstream of Scott Dam is made up of erodible streambank materials including alluvial soils that border the river, alluvial terrace deposits that are currently above the river, and a veneer of colluvium and residual (e.g., in situ) soils of the various rock types—serpentine, sandstone, shale—that occur on the steep backslopes that border the Eel River. In addition, large landslide deposits are present on both sides of the river, approximately 1.5 miles downstream of the dam. These alluvial and landslide deposits are unconsolidated and therefore prone to erosion and movement.

Drawdown of the reservoir would result in a release from Scott Dam of up to 400 cubic feet per second (cfs) into the Eel River for a period of two to four months (see Section 3.4.1.2), which are higher flows than would occur under existing conditions. In addition, following the drawdown and dam lowering/spillway notching, natural flows would pass over the dam area into the Eel River (there would be no storage). The streambanks and existing landslides would be susceptible to erosion during high flows.

The potential to erode or activate landslides downstream of Scott Dam would not be exacerbated by the dewatering of Lake Pillsbury or sediment sluicing through the adit relative to existing conditions. Dewatering would occur within the range of flows that have historically occurred in the Eel River. Flows that spill over the Scott Dam area would not be higher than flows that have historically occurred. Similarly, flows that spill over or around Cape Horn Dam as it is removed would not be higher than flows that have historically occurred. Bank erosion and erosion of existing landslides related to high-flow events are expected to be the same as under existing conditions, and therefore, the Proposed Action would have a negligible effect on streambank erosion downstream of the dams during construction.

Phase 2: Post-facility Removal Effects

Phase 2 includes the initial, temporary physical conditions immediately following removal of the dams (Phase 2a) and Phase 2b (long-term phase) that generally encompasses the recovery phase of the decommissioning effort. During Phase 2b, Scott Dam and Cape Horn Dam would have been removed, Lake Pillsbury would have been dewatered, and restoration activities at these areas would have been initiated. The potential effects of implementing Phases 2a and 2b of the Proposed Action (i.e., post-facility removal effects) are discussed in the following subsections, organized by phase.

Phase 2a: Initial Condition and Preliminary Restoration

Under the Proposed Action, dewatering and sediment sluicing after dam removal could result in the following impacts related to geology and soils in the Eel River:

- The exposed slopes around the former Lake Pillsbury and Van Arsdale Reservoir could be subject to erosion and slope instability, which could cause increased sedimentation into the Eel River.
- Erosion of streambanks below the dams after initial dam removal.
- The release of sediment-laden water after the removal of Scott Dam and Cape Horn Dam could result in increased sediment loading in the Eel River. This is addressed in Section 3.4.1.8.
- Deposited sediment below the dams adjacent to the channel may be susceptible to erosion during subsequent flows. This is addressed in Section 3.4.1.8.

The potential effects to geomorphic processes in the Eel River are addressed in Section 3.4.1.8.

Scott Dam Area and Cape Horn Dam Area

Erosion and Slope Instability

Immediately after removal of Scott Dam and Cape Horn Dam, water would no longer be impounded and formerly inundated areas would be become riverine in nature. The areas that are no longer submerged by water would be barren until restoration efforts are successful and new vegetation takes hold. During this time, the barren slopes would be subject to wind and water erosion and slope instability, which could increase sedimentation into the Eel River. As discussed above, PG&E would implement a Construction Erosion Prevention Plan to minimize erosion and sedimentation into the Eel River until restoration efforts are effective. Implementing a Construction Erosion Prevention Plan would reduce the potential for slope erosion to negligible levels.

Eel River Watershed

Streambank Erosion

As discussed above, the streambanks along the Eel River mostly consist of unconsolidated, erodible sediments, including landslides and rockfalls, and erosion is common in the Eel River downstream of Scott Dam and downstream of Cape Horn Dam (PG&E 2021). The streambanks would be susceptible to erosion during and after removal of the dams.

As part of rapid dam removal, the adit tunnel plug at the base of Scott Dam would be blasted open (approximately 7,000-cfs capacity) to initiate sediment flushing during the first high-flow season following dam lowering and spillway notching. When the adit plug is removed, there would be a release of approximately 7,000 cfs or more from Scott Dam for multiple days depending on inflow conditions. Assuming less than 14,000 acre-feet of storage behind the dam when the adit is blasted open, the storage would drain in one day or less; however, the inflow to the dam from the storm would likely be 7,000 cfs or more and last for multiple days. As a result, the release from the dam would add an additional day of 7,000 cfs to a multiple-day storm event. The No-Action Alternative 1-year, 2-year, 5-year, and 10-year high-flow events at Scott Dam are 304 cfs, 7,420 cfs, 16,500 cfs, and 24,700 cfs, respectively (refer to Section 3.3.1, Table 3.3.1-8). The peak annual inflow at Scott Dam reaches 7,000 cfs in approximately 70 percent of years and reaches 5,000 cfs in approximately 90 percent of years. The release of 7,000 cfs due to adit plug removal would be well within the No-Action high-flow hydrology.

Since flows will not exceed the historical high-flow range, the potential to erode or activate landslides downstream of Scott Dam would not be exacerbated by removal of the dam. Similarly, the erosion of unconsolidated sediments in the Eel River downstream of Cape Horn Dam would not be exacerbated by removal of the dam or sediment flushing relative to existing conditions. Therefore, implementation of the Proposed Action would have no effect on bank stability in the Eel River relative to existing conditions.

Phase 2b: Resulting Conditions and Restoration

Phase 2b is the resulting conditions following restoration. Implementation of Phase 2b of the Proposed Action could result in the following potential effects to soils and geology:

- Reduced soil instability and potential for erosion with implementation of the Restoration Plan in the Scott Dam and Cape Horn Dam areas.
- Reduced water surface elevations in the former Lake Pillsbury could reduce groundwater levels in the vicinity of the reservoir, thereby affecting local groundwater wells.
- Removing Scott Dam would reduce seismic and landslide risks.
- Erosion of the Eel River streambanks below the dams over the long-term.

Scott Dam Area

Erosion and Slope Stability

Under the Proposed Action, PG&E would implement the Restoration Plan. The restoration activities would stabilize the soils at the former dam site, work and staging areas, and former recreation facilities, thereby reducing the potential for erosion. In addition, revegetation of the former reservoir bed would reduce the potential for erosion and slope failures on the slopes surrounding the former exposed reservoir bed, especially after natural vegetation is established. These benefits would also apply to areas around the Project facilities, roads, recreation facilities, and shoreline that would be exposed following dam removal and vulnerable to erosion. With implementation of the Restoration Plan, the Proposed Action would have a beneficial effect on soils and slope stability in the Scott Dam Area relative to existing conditions.

Potential Groundwater Level Effects

The connectivity between groundwater and Lake Pillsbury is currently unknown. Given the absence of information, it is assumed that groundwater in the vicinity of Lake Pillsbury is charged and supported by water contained in Lake Pillsbury. Assuming this connectivity, groundwater levels may decline after the removal of Scott Dam.

The number and location of groundwater wells that could potentially be affected by dewatering Lake Pillsbury are currently unknown. However, it is assumed that lowering the water table could adversely affect at least some wells, leading to higher pumping costs; the need for newer, stronger pumps; and in worst-case scenarios, the need to drill deeper wells. These outcomes would adversely affect private property owners who rely on wells for their water supply. Therefore, the potential effect on groundwater due to the dewatering of Lake Pillsbury is considered an unavoidable adverse impact.

Under the Proposed Action, the Project recreation facilities surrounding Lake Pillsbury that are currently operated and maintained by the United States Forest Service would be removed and their water supplies would be abandoned, so lower groundwater levels would have no effect on the existing developed recreation facilities.

Seismic and Landslide Risks

Scott Dam is located in a region that is considered seismically active. As explained in detail in Section 3.3.6.4, the Bartlett Springs fault, located east of Scott Dam, is the most significant seismic feature near the Project (PG&E 2016). The Bartlett Springs fault is considered active by the California Geological Survey and has the potential to cause significant ground shaking and surface rupture in the vicinity of Scott Dam. Significant ground shaking and surface rupture could jeopardize Scott Dam.

Removal of Scott Dam would alleviate the potential seismic risks associated with movement on the Bartlett Springs fault. Therefore, the removal of Scott Dam and its impoundment (Lake Pillsbury) under the Proposed Action are considered a beneficial effect compared to existing conditions.

Elevated groundwater-initiated movement of the landslide adjacent to and upgradient of Scott Dam (Map 3.3.6-7). With the removal of Scott Dam, water levels in Lake Pillsbury would be restored to pre-dam levels and groundwater in the vicinity of Lake Pillsbury should also decline. Declining groundwater levels should reduce the risk of landslide movement.

Cape Horn Dam Area

Erosion and Slope Stability

Restoration activities to be implemented as part of the Proposed Action would stabilize the soils at the former dam site and reservoir and work and staging areas, thereby reducing the potential for erosion. In addition, revegetation of the former inundation zone would reduce the potential for erosion in the former exposed reservoir area, especially after natural vegetation is established. Restoration activities would also be implemented for areas around the Project facilities, Project roads, and shoreline that are currently exposed and vulnerable to erosion under existing conditions. With implementation of the Restoration Plan, the Proposed Action would have a beneficial effect on soils and slope stability in the Cape Horn Dam Area relative to existing conditions.

Eel River Watershed

Streambank Erosion

After both Scott Dam and Cape Horn Dam are removed, there would be no ability to capture, store, or regulate periodic flood flows. However, future flood flows are anticipated to be within the range of historic events. Consequently, bank erosion related to high-flow events is expected to be the same as in the past, and no effects relative to existing conditions are anticipated.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam in the same year. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

If the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam, sediment released from Scott Dam would settle into Van Arsdale Reservoir. Prior to Cape Horn Dam removal, this material would be removed and stockpiled within the construction areas. As compared to the Proposed Action, this option would result in a longer construction period in the Cape Horn Dam Area, with a potential increase in erosion in the construction areas and potential for spills of hazardous materials used in construction equipment. At Scott Dam, the construction-related effects to geology and soils would be similar to those for the Proposed Action. The same construction and environmental measures would be implemented under the Proposed Action. Therefore, with the implementation of these measures, the effects to geology and soils would be negligible.

If Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam, sediment would be released twice—once following removal of Cape Horn Dam and following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (see Section 2.2.2.1). Similar to the previous option, implementation of this option would result in a longer construction period in the Cape Horn Dam Area, with a potential increase in erosion in the construction areas and potential for spills of hazardous materials used in construction equipment. The same construction and environmental measures would be implemented under the Proposed Action. Therefore, with the implementation of these measures, the effects to geology and soils would be negligible.

Construction and Environmental Measures

To avoid or reduce effects related to geology and soils during construction, PG&E would obtain, prepare, and/or implement the following measures and plans. These measures and plans would be applied during implementation of both Phase 1 and Phase 2 of the Proposed Action, as appropriate. A complete list of construction measures is included in Section 2.2.3.

- Standard BMPs designed to minimize and control soil erosion and sedimentation into the Eel River
- Construction Erosion Prevention Plan with measures that are designed to control erosion and sedimentation into the Eel River
- Hazardous Materials Measures to avoid or minimize the risk of soil contamination from accidental spills including: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing a SPCC Plan with protocols for preventing spills and managing incidents should they occur
- Scott Dam Slope Stability Monitoring Plan
- Public Safety Measures
- Restoration Plan

To avoid or reduce effects related to geology and soils during Phase 2, PG&E would obtain, prepare, and/or implement the following measures and plans. A complete list of measures is included in Section 2.2.3.

- Restoration Plan

Unavoidable Adverse Effects

Reducing the water surface elevation in Lake Pillsbury could reduce groundwater levels in the vicinity of the Lake Pillsbury, thereby affecting local groundwater wells.

References

PG&E (Pacific Gas and Electric Company). 2016. *Regional Geology and Tectonics for the PG&E Northern Area Hydroelectric System, Potter Valley Area Hydro, Lake and Mendocino Counties, California.*

PG&E (Pacific Gas and Electric Company). 2021. Cape Horn Dam Supporting Technical Information Document, Revision 1, dated January.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Figures

List of Maps

List of Acronyms

ac-ft	acre-feet
BMP	best management practices
cfs	cubic feet per second
DREAM-1	Dam Removal Express Assessment Model 1
ft.	feet/foot
mg/L	milligrams per liter
mi.	mile(s)
mi.^{2}	square miles
mm	millimeter
NERF	New Eel-Russian Facility
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
RM	river mile(s)
SWPPP	Stormwater Pollution Prevention Plan
TPCM	two-phase conceptual model
USSD	U.S. Society on Dams
yd.^{3}	cubic yards

3.4.1.8 Geomorphology

This section describes the potential effects to geomorphology that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction and deconstruction effects (Phase 1) and post-facility removal effects (Phase 2). Post-facility removal effects are split into two subphases: Phase 2a – Initial Conditions and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration.

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season after dam removal is initiated, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season, after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Effects were determined by analyzing the potential changes to geomorphology that could result from activities to be implemented under the Proposed Action (see Section 2.2) as compared to the No-Action Alternative (existing condition) (Section 2.1). Final effects determinations consider construction measures and post-facility measures (see Section 2.2.3) included to avoid or mitigate impacts associated with the Proposed Action. Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

This section discusses potential short-term construction-related effects to geomorphic processes and form that could occur during deconstruction (i.e., removal) of the Project dams and associated facilities and removal of the Project recreation facilities. The discussion is organized by the following four areas: Scott Dam (Lake Pillsbury) Area, Cape Horn Dam (Van Arsdale Reservoir) Area, Eel River Watershed, and Russian River Watershed.

The following potential effects to geomorphology resulting from construction-related activities were evaluated:

- Scott Dam Area
  - Potential erosion and sediment delivery to the Eel River from construction activities, including installation of dewatering infrastructure may affect channel morphology
  - Potential Lake Pillsbury bed and shoreline erosion resulting from reservoir drawdown may affect channel morphology
- Cape Horn Dam Area
  - Potential erosion and sediment delivery to the Eel River from construction activities, including installation of dewatering infrastructure, may affect channel geomorphology
- Eel River Watershed
  - Changes in flows in the Eel River during construction may affect channel morphology
- Russian River Watershed
  - Changes in flows in the East Branch Russian River during construction may affect channel morphology

Scott Dam Area

<u>Erosion and Sediment Delivery to the Eel River from Construction Activities</u>

Under Phase 1 of the Proposed Action, several temporary access roads and staging and stockpile areas would be constructed and Scott Dam would be removed. In addition, Project recreation facilities surrounding Lake Pillsbury and all associated features (e.g., facility access roads, water supply wells, water distribution lines) would be removed. Construction work would include lowering and notching the upper portion of the dam and placing clean rubble in the plunge pool area. An adit tunnel (approximately 15 feet [ft.] in diameter; capacity of 7,000 cubic feet per second [cfs]) would be constructed at the base of the spillway, incorporating a temporary plug approximately 8 to 10 ft. from the upstream dam face. At the downstream terminus of the adit tunnel, a channel (approximately 80–90 ft. in length and 7.5–14.5 ft. deep) would be constructed through the spillway apron and concrete buttress to facilitate a continuous pathway for sediment transport from the adit tunnel to the river downstream once flushing begins. Sediment would be dredged from the upstream side of the dam at the location of the adit tunnel to facilitate sediment flushing when the adit plug is removed. A full description of the activities associated with the removal of these facilities is provided in Section 2.2.1.1.

Removal of Scott Dam and other infrastructure has the potential to temporarily erode and deliver sediment to Lake Pillsbury and the Eel River and its tributaries as a result of exposing and creating unstable slopes, toppling of unstable material, and exposing sediment sources to rainfall and potential erosion from adjacent flowing channels.

Temporary access routes and barge launch construction required for construction activities would have the potential to destabilize slopes, compact soils, and remove vegetative cover, exposing soil to rainfall and concentrated runoff. These actions can lead to increased erosion and delivery of sediment into channels or flood-prone areas.

Activities associated with the establishment of construction staging and storage areas, such as grading, stockpiling materials, etc., have the potential to temporarily convey sediments into channels and flood-prone areas. During the establishment of construction staging and storage areas, sediment would be disturbed to create workable ground surfaces. Disturbed areas have the potential to erode on a temporary basis during construction activities and can be transported by storm runoff events into waterways. Stockpile areas also create relatively large piles of unvegetated and unconsolidated sediment that increases the potential for erosion and sediment delivery resulting in sedimentation (defined here as the settling of sediment particles that form an accumulation at a given location).

Installation of dewatering infrastructure has the potential to create a temporary disturbance that would increase erosion and sediment delivery to water bodies. Ground excavation, construction, and water diversion associated with the installation of a cofferdam could cause an increase in sedimentation and instability of the local channel bed and banks. Water bypassed around the work area could be conveyed in pipes and discharged in a concentrated flow that could exceed erosion thresholds, thereby causing erosion and sedimentation downstream of the discharge location. The dewatering and drawdown of Lake Pillsbury is discussed separately below.

Erosion and sediment delivery from removal of Project infrastructure, construction and use of temporary access routes, and construction and use of staging and stockpile areas have the potential to temporarily increase sediment loads to the Eel River and its tributaries. To address and reduce potential erosion and sediment delivery during these construction activities, PG&E would implement several measures, including best management practices (BMPs) designed to minimize and control soil erosion and sedimentation; a Construction Erosion Prevention Plan; and a Stormwater Pollution Prevention Plan (SWPPP). In addition, PG&E would obtain applicable resource agency and construction permits (U.S. Army Corps of Engineers Section 404; State Water Resources Control Board Section 401). With implementation of these construction measures, activities associated with Project infrastructure removal would have a negligible effect on erosion or potential channel sedimentation and alteration of geomorphic processes and form in the Eel River.

Bed and Shoreline Erosion during Reservoir Drawdown

The reservoir storage at the start of the drawdown period (June) would be approximately 50,000 acre-feet (ac-ft) at an elevation of 1,900 ft., which is the maximum water surface elevation under PG&E's current flow variance. At the completion of the drawdown in October, the dam crest elevation would be lowered nearly 40 ft. to an elevation of 1,861.7 ft. at approximately 10,000 ac-ft of storage. During the dam lowering, a large notch (10–15 ft. deep and 150–200 ft. wide; overall discharge capacity between 15,000–40,000 cfs depending on head) would be constructed in the spillway.

PG&E typically uses an elevation of 1,861.7 ft. (10,000 ac-ft) as a minimum storage level in Lake Pillsbury to avoid the potential for bank failure, plugging of the needle valve outlet, and release of sediment-laden water to downstream reaches. During the 2013–2016 drought, the reservoir elevation reached as low as approximately 10,000 ac-ft storage in both the 2013 and 2015 water years (see Figure 3.3.1-17 in Section 3.3.1). No appreciable channel downcutting and erosion of reservoir sediment were observed during this period. Prior to removal of the adit plug, the Lake Pillsbury drawdown rate is proposed to be between about 1 and 2 ft. per day, which is consistent with the U.S. Society on Dams (USSD) Guidelines for Dam Decommissioning Projects (USSD 2015). It is possible that this proposed drawdown rate exceeds the rate during the 2013–2014 drought or that high flows could enter the reservoir as it is being drawn down, which could lead to more channel erosion than observed during the drought.

Sediment eroded from the coarse top-set delta deposits at the upstream end of the reservoir would likely be redistributed and deposited within the reservoir's impoundment and would not be transported past the notched dam. There are likely small amounts of fine sediment also embedded in the top-set delta, and erosion of this fine sediment (e.g., silt and clay) has the potential to be transported through the needle valve or over the notched spillway, which could increase suspended sediment concentrations in the Eel River downstream.

Under the Proposed Action during the initial low-flow season activities (June–October), depending on site conditions, drawdown rates higher than those proposed could increase the risk of inducing landslides along the reservoir shoreline (USSD 2015) (see Map 3.4.1.8-1 and Section 3.4.1.7). Although, the reservoir would be drawn down to an elevation within the historical range and within the range of the typical minimum reservoir storage levels PG&E uses to avoid bank failure, there is the still the potential for erosion during rainfall events that could increase rilling, gullying, and sheet flow, particularly off steeper slopes (see Section 3.4.1.7). PG&E would monitor for excessive erosion and would implement a Construction Erosion Prevention Plan that would include erosion control measures (e.g., straw waddles), where necessary. In addition, PG&E would implement a Restoration Plan as soon as practicable after dewatering begins. With these measures, the potential for slope erosion and increased sedimentation into the Eel River would be reduced to negligible levels.

Cape Horn Dam Area

Erosion and Sediment Delivery to the Eel River from Construction Activities

Under the Proposed Action, Cape Horn Dam and select associated facilities and features would be demolished and removed by construction activities occurring upstream and downstream of the dam. A temporary access road would be constructed, and a bypass flow channel would be constructed with an upstream temporary cofferdam that would be removed when the channel is completed. Two channel-spanning cofferdams would be installed, one upstream and the other downstream of the dam. A bypass flow channel would be excavated and armored through the earthen embankment to pass Eel River flows around the dewatered work area and downstream during construction. The bypass channel would be designed to protect against potential erosion. The concrete dam, the earthen portion of the dam, and the fish hotel/exclusion barrier would be removed. At the end of construction, the cofferdams would be removed. A full description of the activities associated with the removal of these facilities is provided in Section 2.2.1.

Demolition and removal of the existing facilities at Cape Horn Dam would involve similar construction activities as previously described for Scott Dam and would also create similar adverse geomorphic impacts to the Eel River and its tributaries in the Cape Horn Dam Area. These activities could also increase sediment concentrations at the diversion to the East Branch Russian River, potentially requiring sediment management actions to enable diversions to continue during construction. Under the Proposed Action, the short-term construction and deconstruction activities for both Cape Horn Dam and Scott Dam would occur during the same construction season. While this would create the potential for higher temporary increases in total sediment concentrations from construction activities, the overall environmental effect may be lower than if the dams were removed in separate years since the duration of elevated sediment concentrations would be lower.

During the drawdown at Scott Dam, minimum instream flows would continue to be released into the Eel River below Cape Horn Dam, and high flows would flow over the dam after it is notched. During construction at the Cape Horn Dam Area, the flow bypass channel would ensure that high flows would be passed downstream to the Eel River. Thus, flows under the Proposed Action would be similar to the existing condition, and there would be no effect on flows important for geomorphic processes and form in the Cape Horn Dam Area.

To address and reduce potential erosion from construction activities in the Cape Horn Dam Area, PG&E would implement the Construction Erosion Prevention Plan. PG&E would also implement the Sediment/Channel Monitoring and Response Plan. This plan will include measures to monitor the river channel downstream of Scott Dam including the Cape Horn Dam Area during drawdown. PG&E would also develop and implement the Construction Site Water Diversion, Dewatering, and Drawdown Plan. This plan will define measures such as the magnitude and timing of the drawdown. In addition, PG&E would obtain applicable resource agency and construction permits (U.S. Army Corps of Engineers Section 404; State Water Resources Control Board Section 401). With implementation of these construction measures, activities associated with reservoir drawdown would have a negligible effect on erosion or potential channel sedimentation and alteration of geomorphic processes and form in the Cape Horn Dam Area.

Eel River Watershed

<u>Changes in Flow during Construction</u>

Construction activities at Scott Dam would temporarily impact hydrology in the Eel River downstream of Scott Dam. The drawdown of the reservoir using the low-level outlet needle valve would result in a release from Scott Dam of up to 400 cfs into the Eel River for a period of 2 to 4 months. The increase in flow above existing conditions depends on the water year type and minimum instream flow requirements (see flow rates during the initial drawdown compared to under existing conditions in Table 3.4.1.2-1 in Section 3.4.1.2). For the months of June through October, under the existing condition, the flow released into the Eel River downstream of Scott Dam typically ranges from 47 cfs to 320 cfs. Under the Proposed Action, the flow would be approximately 400 cfs. An increase in flow during these months of up to 400 cfs would have no effect on geomorphic process or form in the Eel River.

Russian River Watershed

Changes in Flow during the Lake Pillsbury Drawdown

Construction activities at Scott Dam and dewatering of the construction area at Cape Horn Dam have the potential to impact hydrology in the East Branch Russian River upstream of Lake Mendocino. The drawdown of the reservoir using the low-level outlet needle valve would result in a release from Scott Dam of up to 400 cfs into the Eel River for a period of 2 to 4 months. The timing of the drawdown would be coordinated with water demands in the East Branch Russian River to the extent possible, which could result in a diversion of up to 130 cfs in the East Branch Russian River and release of 270 to 400 cfs to the Eel River below Cape Horn Dam. The increase in flow above existing conditions depends on the water year type and minimum instream flow requirements (see flow rates during the drawdown and under existing conditions in Table 3.4.1.2-1 in Section 3.4.1.2). However, during construction in the Cape Horn Dam Area, two channel-spanning cofferdams would be installed across the Eel River: one upstream of the Van Arsdale Diversion and the other downstream of Cape Horn Dam and the fish exclusion barrier. If the upstream cofferdam is installed in the Eel River above the Van Arsdale Diversion, it would not be operable and diversions into the East Branch Russian River would cease.

For the months of June through October, under the existing condition, the flow released into the East Branch Russian River typically ranges from 10 cfs to 80 cfs. Under the Proposed Action, the flow would range from 0 to 130 cfs during the drawdown (see Table 3.4.1.2-1 in Section 3.4.1.2). Based on the flood frequency values in Table 3.3.1-17 in Section 3.3.1, which shows the existing condition (impaired) flood frequency flows in the East Branch Russian River at U.S. Geological Survey (USGS) gage #11461500 near Calpella, California, the 1-year event is 311 cfs and the 2-year event is 3,350 cfs. Even if the flow is increased to 130 cfs during the construction months, flows of this level and greater are frequently diverted into the East Branch Russian River (see Table 3.3.1-16 in Section 3.3.1). If the upstream cofferdam is installed upstream of the Van Arsdale Diversion, PG&E would develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. Therefore, changes in hydrology during construction would have no effect on geomorphic process or form in the East Branch Russian River.

Phase 2: Post-facility Removal Effects

Post-facility removal effects to geomorphology resulting from physical changes may occur following removals of the dams and recreation facilities/ancillary facilities (Phase 2) compared to the No-Action Alternative (existing condition). The following effects from initial temporary condition and preliminary restoration (Phase 2a) and resulting physical conditions and restoration (Phase 2b) were evaluated:

- Erosion of Lake Pillsbury sediment and transport downstream after dam removal may affect channel morphology (Phase 2a)
  - Erosion of Lake Pillsbury sediment and shoreline erosion
  - Transport, deposition, and remobilization of sediment in the Eel River between Scott Dam and Cape Horn Dam
  - Erosion of Van Arsdale Reservoir sediment
  - Transport, deposition, and remobilization of sediment in the Eel River downstream of Cape Horn Dam
  - Diversion of sediment to the East Branch Russian River
- Reestablishment of geomorphic and sediment processes after dam removals may affect channel morphology (Phase 2b)
  - Mainstem Eel River and tributaries in the former Lake Pillsbury area
  - Eel River between Scott Dam and Cape Horn Dam
  - Eel River downstream of Cape Horn Dam
- Potential increase in 100-year floodplain elevations in the Eel River could occur (Phase 2b)
- Potential increase in sediment concentration and sand and gravel transport at the New Eel-Russian Facility (NERF) may affect operability of the pump and water diversions to the East Branch Russian River (Phase 2b)
- Potential changes in flows in the East Branch Russian River may affect channel morphology (Phase 2b)

Phase 2a: Initial Condition and Preliminary Restoration

The sediment transport and geomorphic response of the Eel River and its tributaries to removal of Scott Dam and Cape Horn Dam are presented separately for different reaches from Lake Pillsbury to the Eel River downstream of Cape Horn Dam. However, for clarity, the focused discussion of the effects of elevated suspended sediment concentrations and analogies from other recent dam removal projects is presented for all reaches combined at the end of this section.

Analysis Methods

Multiple studies performed by Stillwater Sciences to estimate the volume of erodible sediment in Lake Pillsbury, and to assess the processes by which the eroded sediment would be transported and deposited downstream as a result of dam removal, are referenced in this section. The following is a summary of each study's objectives, with more details provided in the subsequent sections.

1. **Conceptual Sediment Erosion Model:** The volume and general locations of impounded sediment within Lake Pillsbury that would be eroded and transported downstream were estimated by development of a conceptual model (Stillwater Sciences et al. 2021a).
2. **Suspended Sediment Transport Model:** A two-phase conceptual model (TPCM) was developed for modeling fine sediment erosion following rapid base level control lowering and incision into reservoir sediment due to draining of Lake Pillsbury as part of dam removal (Stillwater Sciences 2021a). The purpose of the model was to assess the general magnitude and duration of high suspended sediment concentration downstream of Scott Dam.
3. **Sand Transport Model:** The Dam Removal Express Assessment Model 1 (DREAM-1) sediment transport model was used to simulate the erosion and downstream transport and deposition of sand from Lake Pillsbury (Stillwater Sciences 2021b).
4. **Gravel Transport Dynamics:** Sediment pulse evolution theory and observations of previous dam removals were used to predict the transport and deposition of gravel downstream of Scott Dam (Stillwater Sciences 2021b).

Volume of Erodible Sediment and Erosion of Lake Pillsbury Sediment after Scott Dam Removal

The following describes the key Scott Dam removal activities related to sediment erosion and transport. PG&E is proposing the rapid dam removal approach to decommission Scott Dam (McMillen Jacobs Associates 2021). Rapid dam removal entails expedited removal of Scott Dam (approximately 2 years in duration depending on site conditions and flows). Following pre-established protocols related to river flow forecasting, explosives would be detonated to remove the adit plug during or preceding an anticipated flood event of sufficient magnitude to rapidly evacuate fine sediment deposits from the reservoir (likely between December and March). The capacity of the tunnel and channel is considered suitable for evacuating Phase 1 (defined below) sediments (primarily silt and clay) within a few days of opening the tunnel portal at the upstream end (Stillwater Sciences 2021a, as reported in McMillen Jacobs Associates 2021).

Lake Pillsbury – Volume of Erodible Sediment

Using the mapping methods and sediment texture assumptions described in Section 3.3.7.4, Stillwater Sciences et al. (2021a) estimated 21 million cubic yards (yd.^{3}) is impounded within Lake Pillsbury and comprises approximately 56 percent silt and clay, 34 percent sand, and 10 percent gravel.

Stillwater Sciences et al. (2021a) also estimated the volume and general locations of impounded sediment that would be eroded and transported downstream by developing a conceptual sediment erosion model that incorporated prior dam removal observations and professional judgement. The model is based on observations from other dam removals (e.g., Glines Canyon Dam on the Elwha River, Tannery Brook Dam on Tannery Brook, Condit Dam on the White Salmon River) as well as observations of downcutting at the head of Lake Pillsbury in 2014, during a period of drought. The conceptual model modeled anticipated channel downcutting processes on three stream branches in Lake Pillsbury with different gradients and levels of confinement—mainstem Eel River upstream of the Rice Fork, the Rice Fork, and Salmon and Squaw Valley creeks.

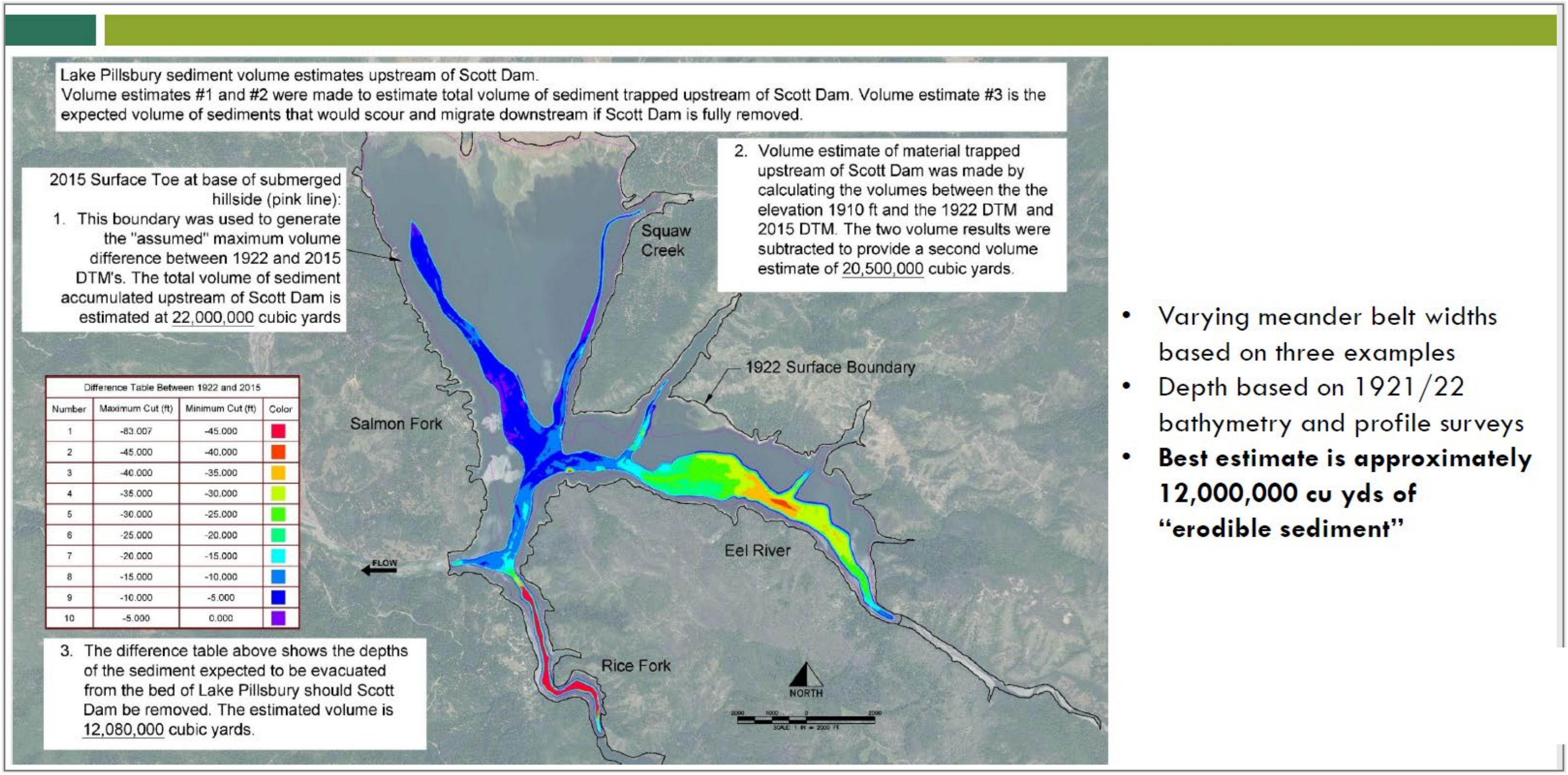
The Stillwater Sciences et al. (2021a) conceptual model estimated that the 12 million yd.^{3} of impounded sediment in Lake Pillsbury could potentially be mobilized downstream of Scott Dam following dam removal. The volume estimate does not account for sediment accumulation since the 2015 bathymetric survey. Figure 3.4.1.8-1 shows how the estimated depth of downcutting into the impounded sediment could vary spatially within Lake Pillsbury. Details on the estimated volumes of erodible sediment from the three stream branches in Lake Pillsbury are provided below.

Mainstem Eel River Upstream of the Rice Fork

The removal of Glines Canyon Dam on the Elwha River in Washington was used as a process model example for the mainstem Eel River upstream of the Rice Fork. Based on the model, the Eel River is expected to migrate across a relatively wide valley as it downcuts through impounded sediment in response to the removal of Scott Dam (see Figure 3-27 in Stillwater Sciences et al. 2021a). Hydraulic geometry relationships were used to estimate bankfull channel widths, which were then used in other relationships to estimate the width of the migrating braiding/meander belt. As the river downcuts, it would be expected to create elevated terraces with side slopes at the angle of repose (assumed to be 1:1). The conceptual model assumed the river would eventually downcut to the elevation and location of the 1921/1922 pre-dam surface. The model did not assume that the braiding/meander belt would migrate fully across the width of the impounded sediment. Instead, the 1921/1922 contour map was used to digitize the estimated pre-dam valley wall, active channel, and floodplain benches, and with professional judgement, the planform boundary/lateral limit of erodible sediment was determined. Impounded sediment outside of this boundary would not be eroded and would remain in place.

Rice Fork

The removal of Condit Dam on the White Salmon River in Washington was used as a process model example for the Rice Fork. A key difference of this stream branch's conceptual model compared to the mainstem Eel River upstream of the Rice Fork is that in the Rice Fork, the estimated braiding/meander belt width was at least as wide as the valley bottom determined from the 1921/1922 contour map (see Figure 3-27 in Stillwater Sciences et al. 2021a). As is visible in Figure 3.4.1.8-1, the width of the mainstem Eel River valley bottom is considerably wider than that of the Rice Fork. The model assumed nearly 100 percent of the impounded sediment would be mobilized and transported downstream when the dam is removed because there would not be sufficient space for lateral migration of a braiding/meander belt to occur that would create terraces of uneroded sediment as the river downcuts to the pre-dam surface.



Source: California Trout et al. 2021.

Figure 3.4.1.8-1. Lake Pillsbury eroded sediment volume estimates.

Salmon Creek and Squaw Valley Creek

The removal of Tannery Brook Dam on Tannery Brook in New Hampshire was used as a process model example for the Salmon Creek and Squaw Valley Creek branch. Like the model for the mainstem Eel River upstream of the Rice Fork, the conceptual model for these two creeks assumed the braiding/meander belt width was less than the 1921/1922 valley bottom width, and therefore not all the impounded sediment would have the potential to be mobilized. The low gradient and low valley confinement of these stream branches mean they are expected to evolve similarly to the Eel River in which some of the impounded sediment would be outside of the braiding/meander belt width and not be eroded.

Fine-Grained Sediment Transport

This section describes the potential for rapid incision and erosion of Lake Pillsbury's bottom-set deposit, primarily composed of silt, clay, and fine sand, following removal of the dam (see Figure 2 in Stillwater Sciences 2021a). Erosion and transport of the top-set deposit, likely primarily composed of gravel and coarse sand, is discussed in subsequent sections.

Under the Proposed Action, the removal of the dam would result in the flushing of a large volume of sediment downstream of the remnant reservoir into the Eel River, likely in a single high-flow season (McMillen Jacobs Associates 2021). Stillwater Sciences (2021a) developed a TPCM for fine sediment erosion of the bottom-set sediment deposit following rapid base level control lowering due to draining of Lake Pillsbury following dam removal. The purpose of the model was to assess the general magnitude of suspended sediment concentration and duration of high suspended sediment concentration impact in the Eel River downstream of Scott Dam (Stillwater Sciences 2021a). Based on the modeling, opening the large adit tunnel at the base of Scott Dam, with approximately 70 ft. of head and potential for base level change, would be expected to cause a rapid increase in shear stress due to the significantly elevated local bed slope that would be created as flow quickly erodes through the reservoir sediment upstream of the adit (Stillwater Sciences 2021a). A relatively narrow and oversteepened channel would initially form in the impounded sediment near the base level lowering at the adit. Channel headcutting would propagate upstream into the impounded sediment and cause continued erosion and sediment evacuation to occur. The impounded sediment would provide an essentially unlimited supply of sediment. The potential volume of fine-grained sediment that would initially be eroded would be "transport limited" (limited by the hydraulic sediment transport carrying capacity of the flow) and would not be limited by the sediment supply (volume of sediment available to be eroded in the remnant reservoir bed) (Stillwater Sciences 2021a). This period of erosion was termed "Phase 1 erosion" by Stillwater Sciences.

Assumptions on the water discharges available, width of the active channel during downcutting, gradient of the channel during downcutting, and other parameters used as input in the TPCM were described by Stillwater Sciences (2021a). Primary modeling assumptions are described as follows:

- The TPCM analysis assumed the same 12 million yd.^{3} of erodible sediment available for fluvial transport downstream as determined from the conceptual erosion model described above (Stillwater Sciences et al. 2021a), which was based on 2015 bathymetry. The 2015 estimates were not extrapolated to account for the additional sediment accumulation in Lake Pillsbury that would occur until Scott Dam removal because the increase was assumed to be small compared to the existing impounded sediment volume, and the accuracy of the analyses was only on the "order-of-magnitude level" (Stillwater Sciences 2021a).

- Although both fine and coarse sediment are expected to be eroded in the 12 million $yd.^3$ estimate, the TPCM assumes 12 million $yd.^3$ of fine-grained sediment would be eroded during Phase 1 erosion (as described in Section 3.3.7.4; It is estimated that the impounded sediment comprises approximately 56 percent fine silt and clay, 34 percent sand, and 10 percent gravel). Assuming all the sediment to be fine grained is a conservative approach that likely overestimates the duration of the turbidity impact compared to the actual impact duration (Stillwater Sciences 2021a). A particle size of 0.011 millimeters (mm) (silt size class) was used as the representative particle size based on 26 samples collected by the USGS in 1964 (Porterfield and Dunnam 1964). Stillwater Sciences (2021a) considered this a conservative overestimate (i.e., provides an estimated longer duration turbidity impact) of the volume of fine-grained sediment available for the suspended sediment concentration analysis since not all of the 12 million $yd.^3$ of erodible sediment would be fine grained, and much of it is located in top-set deposits that would not be eroded by the processes assumed in the TPCM.

When the channel formed through this rapid downcutting reaches the pre-dam historical channel or other non-erodible surface that prevents further downcutting or lateral channel migration, the source of fine-grained erodible sediment would be no longer accessible and the sediment transport would become supply limited, termed "Phase 2 erosion" (Stillwater Sciences 2021a). The primary source of sediment during Phase 2 erosion would be gravity-driven bank slumping as water drains from the sediment deposits (Stillwater Sciences 2021a). The duration of bank slumping would be primarily determined by how quickly the water would drain from the bank sediment deposits until it reaches a water content that enables sediment deposit stability. Another source of sediment during Phase 2 erosion would be local surface erosion during precipitation, but this amount would be expected to be insignificant and negligible considering the area of newly exposed land (<2,300 acres) is a small percentage (approximately 1 percent) of the natural sediment production supplied from the much larger area (approximately 289 square miles [$mi.^2$]) of the upstream watershed (Stillwater Sciences 2021a).

The results of the TPCM are presented for three different discharge scenarios in Table 3.4.1.8-1. The duration of erosion of 12 million $yd.^3$ of Phase 1 erosion fine sediment was calculated to range from 0.8 days at a discharge of 5,000 cfs to 7.7 days at a discharge of 1,000 cfs. The calculated sediment concentration at a discharge of 5,000 cfs (900,000 milligrams per liter [mg/L]) would be nearly twice as high as it would be at 1,000 cfs (457,800 mg/L). By comparison, the peak suspended sediment concentration at USGS gage #11477000, Eel River at Scotia (located near the estuary and upstream of the confluence with the Van Duzen River), of just greater than 10,000 mg/L was measured only three times over the period of record, 1959 to 1979 (see Figure 9 in Stillwater Sciences 2021a). Stillwater Sciences (2021a) also calculated results for an improbable scenario in which the total estimated impounded sediment volume of 21 million $yd.^3$ was eroded to demonstrate that the duration required to evacuate the sediment would still only be

13.5 days at the low discharge scenario (1,000 cfs) and 1.4 days at the high discharge scenario (5,000 cfs) (Table 3.4.1.8-1).

Table 3.4.1.8-1. Calculated magnitude of suspended sediment concentration and duration of 12 million yd.^{3} of Phase 1 fine sediment erosion.

Water Discharge (cfs)	1,000	2,000	5,000
12 Million yd.^{3} of Erodible Sediment			
Maximum suspended sediment concentration (mg/L)	457,800	612,500	900,000
Duration of Phase 1 erosion (days)	7.7	2.9	0.8
21 Million yd.^{3} of Erodible Sediment			
Maximum suspended sediment concentration (mg/L)	457,800	612,500	900,000
Duration of Phase 1 erosion (days)	13.5	5.0	1.4

Source: Stillwater Sciences (2021a): Table 1

Based on the 0.011 mm size particle with settling velocity of 3.58×10^{-4} ft./second used in the TPCM analysis, Stillwater Sciences (2021a) reported the majority of the fine-grained sediment eroded from Lake Pillsbury would be transported past the dam without settling, there would be minimal potential for deposition along the Eel River downstream of the dam, and the reservoir deposit would be transported directly to the Eel River estuary (Stillwater Sciences 2021b). This assumption essentially means the suspended sediment would be transported as wash load.

Since the volume of fine-grained sediment available for Phase 2 erosion was uncertain, estimates ranging from 0 to 10 million yd.^{3} of sediment were analyzed to determine the maximum possible duration (number of days) the suspended sediment load would exceed 5,000 mg/L (see Figure 10 in Stillwater Sciences 2021a). For example, under a scenario of 2 million yd.^{3} of Phase 2 erosion at a water discharge of 2,000 cfs, the duration would likely be about 2 days. Since the impounded sediment would be very deep (> 40 ft. in certain locations), it is likely that Phase 1 erosion would account for the majority of sediment erosion (Stillwater Sciences 2021a). Based on similar analysis performed for the Matilija Dam removal project in the Ventura River Watershed, Stillwater Sciences (2021a) stated that Phase 2 erosion in Lake Pillsbury would be a very small amount and last for a limited duration.

It is important to note that the erosion analysis performed by Stillwater Sciences (2021a) mainly addressed erosion of the bottom-set deposit primarily composed of silt, clay, and fine sand (see Figure 2 in Stillwater Sciences 2021a). When this erosion concludes, erosion of the top-set deposit, likely primarily composed of gravel and coarse sand, would continue during subsequent high-flow events and provide a source of fine sediment from within the coarser sediment matrix. Continued erosion of the top-set deposit would result in a significantly longer period of sediment concentrations above background conditions. It is estimated that, at a minimum, a 2-year flood would need to occur through a drawn down reservoir to erode these sediments before background suspended sediment concentrations during subsequent high-flow events would be obtained. This 2-year flood would mobilize the coarse sediment and release the fines trapped within the coarse sediment.

The duration of high sediment concentrations would also be extended by the time it takes to drain the reservoir after the detonation of the adit and would depend upon the streamflows at the time of the detonation. It is estimated that there would be approximately 10,000 ac-ft of storage remaining behind the dam, and the outlet capacity of the tunnel used for the drawdown is 7,000 cfs. The 2-year flood in the Eel River at this location has a peak discharge of over 11,000 cfs. Therefore, depending on how much of the inflow that exceeds 7,000 cfs is stored within the reservoir below the elevation of the notched spillway, it is possible that it could take some time to drain the reservoir and there could be a delayed flush of fine sediment after the initial tunnel opening.

Further discussion of increased suspended sediment concentrations and observations from previous dam removal projects are provided below.

Sand Transport

Stillwater Sciences (2021b) used the DREAM-1 sediment transport model to simulate the reach-averaged erosion, transport, and deposition of sand deposits in the Eel River eroded from Lake Pillsbury in response to Scott Dam removal. The DREAM-1 model has been used on many other dam removal planning projects.

The model's grain-size distribution was based on an average of the USGS (i.e., from Porterfield and Dunnam 1964) samples with a distribution of 0.0625 to 4 mm and a geometric mean of 0.34 mm (medium sand). Sediment in the model was transported as undifferentiated bed material load, and the sediment transport capacity was determined from Brownlie's (1982) bed material equation (Cui et al. 2006). The model assumed finer particles such as silt and clay were treated as wash load that was transported downstream without re-deposition once entrained by the flow (see discussion above about fine grained sediment transport) (Cui et al. 2006). The DREAM-1 model was not designed for dam removal simulations where silt and clay are a major percentage of the reservoir deposit since silt and clay would act as a cohesive agent to slow erosion of reservoir sediment (Cui et al. 2006). The primary model input parameters were (1) pre-dam longitudinal channel profile extending 3.8 river miles (RMs) on the Eel River and 2.1 miles (mi.) on the Rice Fork, upstream of Scott Dam; (2) channel longitudinal profile and active channel width downstream of Scott Dam; (3) impounded sediment deposit thickness and size gradation; (4) long-term average annual sand supply; and (5) daily average discharge. Full details on the model input parameters are described in the Stillwater Sciences report (2021b). The downstream boundary condition for the model was the Middle Fork Eel River. It is important to note that the modeling assumed that Cape Horn Dam was still in place.

The current condition model with both dams in place was run for a 10-year period and showed minimal sand deposition in the reach from Scott Dam to Cape Horn Dam (see Figure 15 in Stillwater Sciences 2021b). Maximum sand deposition of up to 6 inches (in). was predicted in Van Arsdale Reservoir, and the deposit was only stored temporarily until it was flushed over Cape Horn Dam during high flows (Stillwater Sciences 2021b). It is noted that local sand deposition of several feet in local scour holes could occur within the reach.

The analysis of Scott Dam removal in this section is focused on the model run that assumed a 15-ft.-diameter tunnel in Scott Dam (represented as T15 in the Stillwater Sciences 2021b report). Model runs were simulated for wet, median, and dry water years with different starting reservoir pool levels.

The model showed that the sand deposit in Lake Pillsbury would have a rapid rate of erosion following dam removal (see Figure 17 in Stillwater Sciences 2021b). In a wet year simulation, nearly 3 million tons of cumulative sand were eroded and transported past Scott Dam within the first several days, with 3.6 million tons eroded and transported within about 60 days. The rate of erosion decreased dramatically after 60 days and slowly reached about 4.2 million tons within 1,500 days of model simulation. For a dry year simulation, the trend in the rate of sand transport was similar. It took about 50 days to erode and transport 1.5 million tons of cumulative sand and 350 days to reach 3.6 million tons.

The DREAM-1 model simulation results included longitudinal profile graphs that showed temporal downcutting of the channels into the impounded sediment in Lake Pillsbury. For the wet year scenario, the mainstem Eel River and Rice Fork channels were shown to downcut to their pre-dam elevations within 1 week of dam removal throughout most of the modeled sediment deposit except for about 1 mi. immediately upstream of Scott Dam (see Figure C-15 in Stillwater Sciences 2021b). Model results predicted that within 1 year, both channels would have essentially downcut to the pre-dam elevations throughout the entire thickness of the deposit upstream of the dam. The rate of downcutting and return to pre-dam elevations were slower for the dry year scenario (see Figure C-47 in Stillwater Sciences 2021b). The modeling predicted that after 1 week, the Rice Fork would have eroded to pre-dam elevations beginning about 1.6 mi. upstream of Scott Dam and the Eel River eroded to pre-dam elevations about 3 mi. upstream of the dam. Similar to the wet year scenario, after 1 year the channels had returned to their pre-dam elevations throughout the entire deposit.

Gravel Transport

Based on the assumption that gravel is typically about 5 to 10 percent of total sediment production (which is primarily composed of sand, silt, and clay), Stillwater Sciences (2021b) estimated that approximately 2 million $yd.^3$ of gravel is currently deposited in Lake Pillsbury.

Sediment pulse evolution and experience gained from previous dam removal projects indicate that erosion and transport of the gravel deposit would primarily occur by dispersion (i.e., the deposit gradually spreads and “melts away” over time), with a limited range of downstream deposition (see Figure 9 in Stillwater Sciences 2021b). Since the gravel is primarily located in the reservoir’s top-set deposit at least a mile or two upstream of Scott Dam, gravel deposition following dam removal would likely occur within the eroded channel formed in the Lake Pillsbury area currently occupied by fine-grained sediment and would be unlikely to extend beyond the low-gradient channel reach within the first 2 mi. downstream of Scott Dam (Stillwater Sciences 2021b).

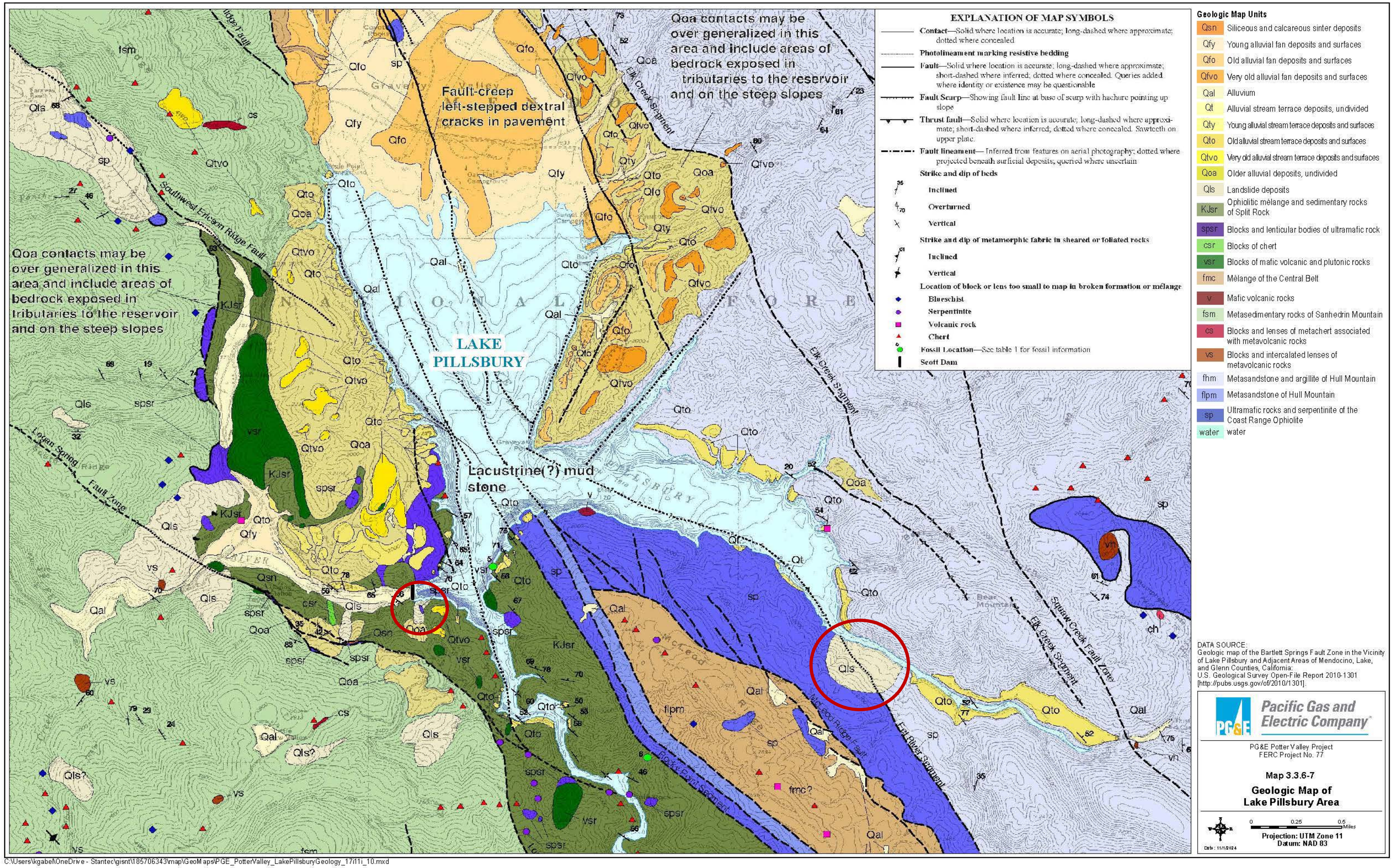
Geomorphic Response in Lake Pillsbury

As the Eel River downcuts in the exposed reservoir bed, it is expected to create elevated terraces with side slopes at the angle of repose (assumed to be 1:1). It is likely that the morphology of the actively downcutting river would be a relatively low-gradient, sinuous, and widely braided channel, especially in areas of impounded coarse-grained sediment where the valley width is wide. The conceptual model (described previously) assumes the Eel River and its tributaries would eventually steepen in gradient as they downcut to elevations, locations, and channel widths like those observed in 1921/1922 pre-dam topography (Stillwater Sciences et al. 2021a). The sediment modeling described above predicts most of the sand erosion and downcutting to pre-dam reservoir elevations would occur within 60 days to a year after dam removal, depending on post-Scott Dam breaching water year type and hydrology. Although dependent upon the pattern of flood flows following dam removal, observations from other dam removal projects suggest it could take 2 to 5 years for the channel to return to its pre-dam location (Stillwater Sciences et al. 2021b). Because of high sediment loads, the initial channel morphology may not include topographic complexity, such as large pools, but as the sediment supply diminishes it is likely that better defined pools and riffles would form (Stillwater Sciences et al. 2021b). It was also noted that a rapid dam removal approach, as opposed to a phased approach, would result in more rapid downcutting into the impounded sediment with less time for the river to laterally migrate and erode deposits and resulting in more sediment remaining as terraces of floodplain deposits (Stillwater Sciences 2021b).

Bed and Shoreline Erosion from Rapid Dam Removal

During the first high-flow season (likely between November and May, depending on river flow forecasting), under the Proposed Action, the adit plug in Scott Dam would be detonated and rapid draining of the remaining impounded water would occur, likely within a few days (Stillwater Sciences 2021a, as reported in McMillen Jacobs Associates 2021). There is potential for embankment slope failures or potential landslides along the shoreline due to reservoir lowering during the final rapid draining of the reservoir. In particular, there is a historical landslide deposit on the upstream, left abutment of the dam and a historical landslide deposit on the south side of the Eel River arm of Lake Pillsbury near the top of the reservoir (Map 3.4.1.8-1).

Some qualitative assumptions of the potential shoreline erosion due to the proposed rapid removal of Scott Dam are presented below. These assumptions are informed by the previously described conceptual modeling of the potential erosion of reservoir sediment during a rapid removal of the dam (Stillwater Sciences et al. 2021a). As described above, the rapid removal would result in an estimated erosion of 12 million $yd.^3$ of impounded sediment in Lake Pillsbury. The amount of erosion would likely vary along the existing shoreline. The depth of channel downcutting would be expected to be greatest, and occur most rapidly, in the lower portion of Lake Pillsbury, where the sediment texture is relatively fine grained and the deposit depths are generally thickest. Shorelines in these locations may be most susceptible to instability and higher rates of erosion, particularly near the historical landslide just upstream of the dam. Rapid removal could cause instability of the landslide location (see Section 3.4.1.7). In the relatively confined valley of the Rice Fork, the conceptual erosion model suggests that nearly 100 percent of the impounded sediment would be mobilized and transported downstream, and elevations and slopes along the existing shoreline in this valley would be likely to return to pre-dam conditions (Stillwater Sciences et al. 2021a).



Map 3.4.1.8-1. Geologic map of the Lake Pillsbury area with historical landslide deposits upstream of Scott Dam highlighted (red circle).

This Page Intentionally Left Blank

At other locations along the reservoir shoreline, such as the mainstem Eel River upstream of Rice Fork and in the Gravelly Valley area of Salmon Creek and Squaw Valley Creek, a braiding/meander belt is expected to form and downcut and laterally migrate and erode sediment across a portion of the pre-dam valley width (Stillwater Sciences et al. 2021a). Some of the impounded sediment would be outside of the braiding/meander belt width and not be eroded. The shoreline elevations and slopes in these locations outside of the braiding/meander belt would nearly match the profile of the impounded sediment observed in recent bathymetry surveys. The exposed substrate would be unvegetated initially, and gravitational-driven slumping of side slope material may occur at locations where the slope of the exposed substrate is greater than the angle of repose necessary for sediment stability. The potential for slumping would be relatively high as water drains from the deposits following reservoir draining and would be influenced by the rate of draining. The potential for instability would subside as water content decreases. The sediment deposits would reduce in volume and height as they dry and consolidate, further reducing the potential for gravitational failure. These areas would also be susceptible to erosion from precipitation runoff over the newly exposed surface, especially until vegetative cover is reestablished.

At locations where the braiding/meander belt erodes into or near the existing shoreline, flows after dam removal would be expected to create elevated terraces with steep side slopes at the angle of repose (Stillwater Sciences et al. 2021a). These areas would undergo similar erosion processes until slope angles are reduced to stable levels for the substrate and vegetation reestablishes.

To address and reduce potential erosion during reservoir drawdown, PG&E would implement the Construction Erosion Prevention Plan. PG&E would also implement the Sediment/Channel Monitoring and Response Plan. This plan will include measures to monitor the formation of new channels within Lake Pillsbury during drawdown. PG&E would also develop and implement the Construction Site Water Diversion, Dewatering, and Drawdown Plan. This plan will define measures such as the magnitude and timing of the drawdown. In addition, PG&E would obtain applicable resource agency and construction permits (U.S. Army Corps of Engineers Section 404; State Water Resources Control Board Section 401). With implementation of these construction measures, activities associated with reservoir drawdown would have a negligible effect on erosion or potential channel sedimentation and alteration of geomorphic processes and form.

Observations from Previous Dam Removals

Although there are differences in dam removal approach, geomorphic setting, regional hydrology, and the volume and gradation of trapped sediments, previous dam removal projects provide useful comparisons of the ranges of observed rates of erosion of impounded sediment behind these dams.

<u>Klamath River Dam Removals</u>

Approximately 13.1 million yd.^{3} of sediment were estimated to be trapped in the reservoirs formed by J.C. Boyle (990,000 yd.^{3}), Copco No. 1 (7,440,000 yd.^{3}), and Iron Gate (4,710,000 yd.^{3}) dams removed from the Klamath River in 2024 (U.S. Bureau of Reclamation 2012). The grain size of the sediment behind the Klamath dams was reported as 79 percent silt and clay, 18 percent sand, and 3 percent gravel or larger (Gathard Engineering Consulting 2006).

With similarities to the proposed dam removal approach for Scott Dam, the Klamath River dam removals are an example of a rapid dam removal approach in which water levels from the reservoirs were quickly drained by opening low-level gates or blasting tunnels near the base of the dams. On January 11, 2024, the low-level tunnel was used to drain Iron Gate Reservoir slowly over several weeks. Shortly thereafter, on January 16, 2024, a 10-ft.-diameter tunnel was blasted at the base of J.C. Boyle Dam located upstream of Iron Gate Dam. On January 23, 2024, a 12-ft.-diameter tunnel was blasted at the base of Copco No. 1 Dam, located between Iron Gate and J.C. Boyle dams.

Hydraulic modeling and sediment transport analysis performed as part of planning studies for the Klamath River dam removals predicted that about half of the impounded sediment behind the dams would naturally erode and be transported out of the reservoir areas in a median water year (U.S. Bureau of Reclamation 2012). The pattern of reservoir sediment erosion observed on the Klamath River varied depending on several variables, such as distance upstream from the dam breach, valley confinement, and whether erosion was in the mainstem river or its tributaries. In general, the mainstem river rapidly incised through the impounded sediment and laterally eroded sediment across a braiding/meander belt as it ultimately downcut to its pre-dam location and elevation profile. The width of the eroded belt varied with location and did not always extend across the full width of the impounded sediment deposit. Terrace deposits remain in the portions of the pre-dam valley beyond the limits of the eroded belt. In the tributaries, the rapid rate of channel incision seemed to outpace erosion from lateral migration as the channel downcut. This resulted in formation of terrace deposits up to 15 ft. higher than the new channel profiles. Heavy machinery, including excavators, was used at some locations following the dam breaches as part of *assisted sediment evacuation* work along the mainstem river and tributaries to push recently exposed terrace deposits into the flowing channels so it could be transported downstream, thus increasing the amount of evacuated impounded sediment. Additional discussion of Klamath River suspended sediment concentrations is presented in the Elevated Suspended Sediment Concentrations section.

Elwha River Dam Removals

On the Elwha River in Washington, two dams (Elwha Dam and Glines Canyon Dam) were simultaneously removed through a phased approach. The Elwha Dam (located 4.9 mi. upstream of the mouth at the Strait of Juan de Fuca) trapped about 6.5 million $yd.^3$ of sediment in Lake Ardwell and Glines Canyon Dam (13.4 mi. upstream of the mouth) about 21 million $yd.^3$ of sediment in Lake Mills (Warrick et al. 2015). The sediment gradation was 54 percent sand, gravel, and cobble and 46 percent silt and clay (Randle et al. 2015). The water levels at Lake Aldwell and Lake Mills were gradually lowered from June 2011 to October 2012 through a series of progressive dam notches beginning in September 2011 (East et al. 2015). By mid-March 2012, the water in Lake Aldwell was entirely drained and coarse-grained sediment prograding downstream was being transported past the former dam site (East et al. 2015). Lake Mills was entirely drained of water in October 2012, and around October 14, 2012, the prograding reservoir sediment began overtopping the remaining ~52 ft. of Glines Canyon Dam (East et al. 2015).

The slopes of the alluvial sections of the river were 0.4 percent in the lower reach and 0.7 to 0.8 percent in the middle reach between the two dams (East et al. 2015). Approximately 32 percent of the combined reservoir sediment was eroded over 2 years (East et al. 2015), and 65 percent was eroded at the end of the fifth year (Ritchie et al. 2018). During these 5 years, approximately 10 percent of the eroded sediment was deposited in the river channel and floodplain, 26 percent was deposited in and near the coastal delta (13.4 mi. downstream of Glines Canyon Dam), and the remaining 64 percent was transported offshore (Ritchie et al. 2018).

Erosion of sediment from the Elwha River dams exceeded predictions from both numerical and physical models, which had predicted less than half of the stored reservoir sediment would erode (Ritchie et al. 2018). These observations demonstrate the limitations of modeling to accurately predict the magnitude of lateral erosion of reservoir deposits (Ritchie et al. 2018). In general, the modeling provided reasonably accurate predictions of the general patterns of sediment erosion, transport, and deposition, but were less accurate in terms of the short-term magnitude and timing of these processes (Warrick et al. 2015).

The morphologic response of the Elwha River downstream of the dams included a smoothing of the longitudinal profile as pools filled with sediment and the river aggraded substantially and developed a more braided pattern (Ritchie et al. 2018). During the second year of dam removal, the river began to incise into the newly deposited sediment, and a rapid decrease in channel braiding was observed as the sediment pulse diminished (see Figure 4 in Ritchie et al. 2018). Within the first 2 years of dam removals, only approximately 4 percent of the eroded silt and clay sediment deposited in the river and 7 percent in the coastal system, with about 89 percent of the fine-grained sediment being transported far offshore of the delta due to the energetic coastal environment (Warrick et al. 2015). Although the vast majority of silt and clay was transported all the way to the ocean, the extent of the observed deposits contrasted with the assumption that silt and clay would entirely bypass the river system (Draut and Ritchie 2015). By 18 months after dam removals, silt and clay deposits on the channel margins and floodplain were commonly over 1.6 ft. thick and included deposition in the interstitial spaces of cobbles. Researchers studying the dam removals noted that even in short and steep drainages such as the Elwha River, future planning should recognize that even though silt and clay fluvial sedimentation may be a small proportion of the total amount of sediment deposited, it may be hydrologically or ecologically impactful (Warrick et al. 2015). Additional discussion of Elwha River suspended sediment concentrations is presented below.

Marmot Dam and Condit Dam Removals

On the Sandy River in Oregon, approximately 58 percent of the sediment behind Marmot Dam was eroded over 2 years in response to a rapid dam removal approach that created a large and sudden lowering of the base water level, which resulted in upstream propagation of major knickpoints into the impounded sediment (East et al. 2015).

The 125-ft.-tall Condit Dam on the White Salmon River in Washington impounded a fine-grained sediment gradation of 35 percent silt and clay, 60 percent sand, and 5 percent gravel (Wilcox et al. 2014). The dam was removed in October 2011 through a rapid approach by blasting a 16-ft.-wide hole in the base of the dam that resulted in release of 2.1 million yd.^{3} of sediment during a rapid reservoir drawdown. The reservoir's water and ~10 percent of its sediment evacuated within 90 minutes of blasting, and approximately 55 percent of the reservoir sediment was eroded over only 15 weeks. Rapid incision into the impounded sediment was followed by mass-movement of the predominantly fine-grained sediment. The mass erosion delivered sediment faster than fluvial processes of channel incision and knickpoint migration could have delivered sediment (Wilcox et al. 2014). Additional discussion of White Salmon River suspended sediment concentrations is presented below.

Eel River—Scott Dam to Cape Horn Dam

This section discusses changes in Eel River between Scott Dam and Cape Horn Dam that would occur primarily due to evacuation of erodible sediment from Lake Pillsbury and a return to unimpaired hydrology after Scott Dam is removed.

Fine Sediment Transport

As previously discussed, millions of cubic yards of fine-grained sediment (silt and clay) are expected to be evacuated from Lake Pillsbury during several days of high flows immediately following removal of Scott Dam (Stillwater Sciences 2021a). The Stillwater Sciences (2021a) TPCM erosion and suspended sediment concentration analysis assumed finer particles such as silt and clay are treated as wash load that would be transported downstream without re-deposition once entrained by the flow (Cui et al. 2006). How much of the fine-grained sediment would be transported in suspension through this reach is uncertain. The vast majority is expected to be transported through the reach, but because of the large volumes, a still-significant volume may deposit and alter channel or floodplain morphology—at least temporarily until subsequent high-flow events can resuspend it and transport it farther downstream. As previously noted, on the Elwha River, the observed silt and clay deposition within the interstitial spaces of coarser substrate and on the channel margins and floodplain were somewhat contrary to the assumption that silt and clay would entirely bypass the river system (Draut and Ritchie 2015).

Sand Transport

The more significant geomorphic change to the Eel River downstream of Scott Dam would be related to transport and deposition of Lake Pillsbury eroded sand through the reach. The DREAM-1 modeling, which assumed Cape Horn Dam and Van Arsdale Reservoir impounded sediment would still be in place, predicted sand deposition in the reach from Scott Dam to Cape Horn Dam could initially be several feet thick and concentrated in Van Arsdale Reservoir, primarily between Cape Horn Dam (RM 156.8) to about 3 mi. upstream to RM 160. The modeling showed that sand deposition under the wet year scenario reached a maximum thickness of nearly 11 ft. at RM 158 in Van Arsdale Reservoir (at Pioneer Bridge), just upstream of Cape Horn Dam, but only persisting for the first few days after dam removal (see Figure C-16 in Stillwater Sciences 2021b). At 400 days after dam removal, the thickness increased again at RM 158 to about 4 ft. and by 800 days it reduced to about 0.4 ft.

The sand deposition was more pronounced for the dry year scenario, with a maximum thickness of 13 to 19 ft. between RM 158 and RM 162. The sediment deposit would persist for about 300 days before subsequent storm events could remobilize it and transport it farther downstream (see Figure C-48 in Stillwater Sciences 2021b). For both the wet and dry year scenarios, it is likely the maximum thickness of the deposited sediment would be substantially less if Cape Horn Dam was not in place since the channel slope through the reach would be steeper and capable of transporting a higher volume of sand. The deposits were predicted to be remobilized and transported farther downstream after subsequent flow events and to vanish from the reach after an approximate 5-year event (see Figure C-48 in Stillwater Sciences 2021b).

The sand deposition would temporarily adversely affect channel morphology. It would likely lead to partial or complete filling of pools and burial of coarse channel substrate that would diminish aquatic habitat. The elevated sediment deposition would be temporary as subsequent flood events through restored, unimpaired Eel River hydrology following the dam removals would remobilize most of the deposited sand and flush accumulated sediment from pools and coarse channel substrate. Stillwater Sciences (2021b) also commented that if a gravel transport model were developed, the predicted combined sediment deposition would not simply be the sum of simulated sand deposition and simulated gravel deposition. Rather, the total combined gravel and sand deposition would likely be only slightly higher than the modeled sand deposition since the deposition of gravel would largely displace rather than add to the deposited sand.

Infrastructure EFFECTS

The sediment deposition has the potential to impact infrastructure located downstream of Scott Dam. The two bridges in the reach from Scott Dam to Cape Horn Dam that would experience predicted increases in bed elevation based on the DREAM-1 sand deposition modeling following Scott Dam removal are Soda Creek Bridge and Pioneer Bridge (see Table 3.4.1.8-2). The bridge deck low chord elevations are from Table 5 and the Eel River channel thalweg elevations at the bridges are interpolated from Figure 5 in the Stillwater Sciences (2021c) report. The maximum sediment deposition thickness is listed for the bridges as well as comments on the range of sediment thickness over the duration it is predicted to persist for the dry year scenario. The approximate distance from the Eel River channel bed thalweg to the bridge low chord elevation is 34 ft. at both bridges. The maximum sand deposit thickness is 4 ft. at Soda Creek Bridge and 13 ft. at Pioneer Bridge. The predicted 13 ft. of deposition at Pioneer Bridge is likely an overestimate since the Proposed Action states both Scott Dam and Cape Horn Dam would be removed during the same construction season, and thus the backwater effect created by Cape Horn Dam and Van Arsdale Reservoir would be less than assumed in the DREAM-1 modeling. Sand deposition would be predicted to temporarily reduce conveyance capacity at the Eel River bridges, but the top elevations of the deposited sand are predicted to be well below the bridge decks (Table 3.4.1.8-2).

Table 3.4.1.8-2. Modeled sand deposition at Eel River bridges.

Bridge	River Mile	Bridge Low Chord Elevation[a] (NAVD88 ft.)	Eel River Thalweg Elevation[b] (ft.)	Maximum Sand Deposit Thickness[c] (ft.)	Range and Duration of Sand Deposition (ft.)
Soda Creek Bridge	167.5	1,734	1,700	4	2 to 4 ft. of deposition for ~300 days
Pioneer Bridge	157.9	1,529	1,495	13	6 to 13 ft. of deposition for ~325 days followed by 2 ft. for 700 days
Hearst-Willits Road Bridge	144.8	1,328	1,300	4	Duration not reported
Eight Mile Bridge	126.2	1,040	1,010	0.5	Duration not reported

a From Table 5 in Stillwater Sciences (2001c).
b Interpolated from Figure 5 in Stillwater Sciences (2001c).
c Interpolated from Stillwater Sciences (2021b) DREAM-1 sand transport model for the 15-ft.-diameter tunnel, dry hydrology scenario T15(D), Figures C-48 and C-50.

Stillwater Sciences (2021c) investigated the potential impact of sedimentation on flood levels by developing a one-dimensional Hydrologic Engineering Center River Analysis System (HEC-RAS) model for the 49-mi. reach of the Eel River between Scott Dam (RM 168.5) and the Middle Fork Eel River confluence (RM 119.4). This reach includes four bridge crossings, and the model assumed Cape Horn Dam was still in place.

The channel bottom elevations were increased by 14 ft. for the cross-sections within the reach where sediment deposition was predicted to be the highest, between Cape Horn Dam (RM 156.8) and RM 160, to represent the modeled sediment deposition from the DREAM-1 model.[1] The 2-year event for the post-Scott Dam removal unimpaired hydrologic condition was selected for analysis with the adjusted elevations since this event does not have sufficient capacity to erode and transport downstream the entire 14 ft. of accumulated sediment (i.e., the sediment deposit would persist through the flood and reduce flow conveyance capacity) (Stillwater Sciences 2021c). The results show the water surface elevation profile for the 2-year event would be lower than the existing 100-year flood water surface elevations and lower than the Pioneer Bridge (see Figure 7 in Stillwater Sciences 2021c). With the adjusted bed elevations, the distance from the 2-year event water surface elevation to the bridge low chord is 14 ft. at Soda Creek Bridge and 9 ft. at Pioneer Bridge.

A similar scenario with 14 ft. of bed sediment accumulation was not modeled for the unimpaired 100-year flood since it is likely that the accumulated sediment would be flushed out prior to the peak of the 100-year event (Stillwater Sciences 2021c). They also state that the probability of a

1 The 14 ft. of deposition is based on a Scott Dam vertical notching alternative that is no longer being considered as the Proposed Action is a 15-ft.-diameter tunnel.

100-year event occurring over the duration for which the accumulated sediment is predicted to persist would be low. Furthermore, the modeling indicated that most of the accumulated sediment would be flushed out of the reach by a relatively frequent peak flow event such as the 5-year flood event, which would restore flow conveyance prior to a higher magnitude peak flow event flowing through the reach (Stillwater Sciences 2021c).

The 2-year event scenario modeled by Stillwater Sciences (2021c) for a vertical dam notching alternative does not exactly represent the conditions for the Proposed Action's approach of a 15-ft.-diameter tunnel in Scott Dam. As previously described, the thickness of sediment deposition following removal of Scott Dam with the 15-ft.-diameter tunnel approach during a dry year scenario is predicted to be greatest in the reach between Cape Horn Dam (RM 156.8) and 5 mi. upstream to RM 162, which includes Pioneer Bridge (RM 158). The sand deposition would be more pronounced for the dry year scenario, with a maximum thickness of 13 to 19 ft. between RM 158 and RM 162. The sediment deposit would persist for about 300 days before subsequent storm events remobilize it and transport it farther downstream. Even with the differences in sediment deposit characteristics, the conclusions are similar to those stated by Stillwater Sciences (2021c):

1. Deposition of sand in the Eel River downstream of Scott Dam would decrease conveyance capacity at the existing bridges until the accumulated sediment is transported downstream. Accounting for the predicted sediment deposition, at the 2-year event there would be approximately 9 ft. of freeboard remaining between the flood's water surface elevation and the low chords of the Soda Creek and Pioneer bridges.
2. The reduced flood conveyance is not likely to apply to higher magnitude, less frequent, flood events as the 5-year flood event is predicted to mobilize the majority of the accumulated sediment out of the reach, and all of the sediment would likely be flushed out during a 100-year event.

Even though the modeling suggests sedimentation would not be problematic for bridge infrastructure or increasing flood risk, given the inherent uncertainty in hydraulic and sediment transport modeling, it is feasible that sedimentation could create an adverse effect. Sediment deposition also has the potential to adversely impact other infrastructure along the river, such as water intakes or diversions, whereby they become buried or plugged and become inoperable or require ongoing management. To address and reduce the potential impacts to infrastructure, PG&E would develop and implement the Sediment/Channel Monitoring and Response Plan. The plan would include measures for monitoring potential sediment deposition and reductions in flow conveyance at the bridge locations that may occur during drawdown and notching of the dam. PG&E would also develop and implement the Flood Monitoring Plan, which will establish monitoring of water levels and flood risks, define measures to protect downstream infrastructure and surrounding areas, and define a process for addressing any potential issues. With implementation of these measures, potential effects to infrastructure from sand deposition during construction are considered negligible.

Gravel Transport

The supply of gravel size and coarser sediment to this reach would increase when Scott Dam is removed and the Eel River and its tributaries downcut and laterally migrate into and erode sediment impounded by Lake Pillsbury. Based on a qualitative assessment, Stillwater Sciences (2021b) predicted that following Scott Dam removal, most of the deposition of the eroded gravel would be expected to occur within the eroded channel formed within Lake Pillsbury's fine-grained deposits and unlikely to extend much farther than the low-gradient channel reach within the first 2 mi. downstream of Scott Dam (Stillwater Sciences 2021b).

The analysis cited the removal of Marmot Dam on the Sandy River, Oregon, in which deposition of nearly all the gravel occurred within 1 mi. of the dam (Stillwater Sciences 2021b). On the Elwha River dam removals, however, appreciable amounts of coarse substrate were transported over 13 mi. from the dam into the coastal zone (Warrick et al. 2015). The 0.7 to 0.8 percent channel slope in the middle reach between the two Elwha River dams was higher than the typical slope of the Eel River, which is 0.3 percent or less. Eroded sand from the Lake Pillsbury deposit is predicted to be transported farther downstream than gravel (Stillwater Sciences 2021b). The DREAM-1 modeling also assumes Cape Horn Dam is still in place.

Given the inherent uncertainties in modeling sediment transport in response to dam removal and the diverse geomorphic responses observed in previous dam removal projects, the timeframe over which sediment supply would remain elevated and how far downstream the effects would extend are not definitively known. Stillwater Sciences et al. (2021b) estimated that most of the erosion and generation of coarse sediment supply from Lake Pillsbury would occur within the first 2 to 5 years, until the channels reach their pre-dam elevations and erosion rates stabilize, though the timeframe is an estimate since the gravel content within the volume of erodible sediment in Lake Pillsbury is unknown, and the nature of subsequent flood events available to erode and transport sediment following dam removal cannot be predicted.

For the first several years, the increase in the combined coarse sand and gravel supply to the Eel River downstream of Scott Dam would be greater than it was during the many decades the dam trapped the coarse sediment supply and greater than it was before the dam was built. It is probable that aggradation would occur within portions of the reach. Long-term aggradation may occur that raises the bed elevation profile, though, as indicated by the DREAM-1 modeling, much of the sand sediment initially deposited would likely be remobilized in subsequent floods and transported farther downstream. A beneficial effect of removing Scott Dam is the currently over-coarsened sediment gradation in the reach would become less coarse with the renewed sand and gravel supply. New bars may form that promote natural fluvial processes, such as increased bank erosion, lateral channel movement, and uprooting of dense riparian vegetation.

The nature of the changes would vary depending on the valley width and slope of a given sub-reach. Relatively wide and low-gradient reaches would experience more sediment deposition than narrower and steeper reaches. The amount of aggradation would be expected to decrease overall in a downstream direction as the distance from the sediment source increases and additional flow inputs from tributaries within the reach would provide additional ability to transport the sediment farther downstream (Stillwater Sciences et al. 2021b).

Van Arsdale Reservoir and Cape Horn Dam Area Sediment Erosion

Approximately 40,000 to 50,000 $yd.^3$ of sediment would be excavated to provide access for the creation of the control section in the dam and to construct the new pump station and conveyance pipe. The remainder, however, would be flushed down the river by high flows once the cofferdams have been removed. After construction activities related to dam removal through November of the first year have been completed and the construction cofferdams have been removed, the remaining impounded sediment in Van Arsdale Reservoir would be allowed to be transported downstream by fluvial processes during subsequent high-flow events.

If 1.7 million $yd.^3$ of sediment has been trapped behind Cape Horn Dam (McMillen Jacobs Associates 2021) and 40,000 to 50,000 $yd.^3$ of sediment are mechanically excavated as part of dam removal activities, then approximately 1.65 million $yd.^3$ of sediment would need to be eroded by fluvial processes to attain pre-dam elevations.

Several factors indicate the process of sediment erosion from Van Arsdale Reservoir would be different from Lake Pillsbury. Van Arsdale Reservoir has no visible fine sediments, but rather a stream channel bed composed of gravel, cobble, and boulders (Geosyntec 2000). The volume and depth of impounded sediment is far lower than in Lake Pillsbury. Additionally, the valley width is much narrower than in Lake Pillsbury, which would limit or preclude the channel from extensively migrating into and eroding lateral deposits as it downcuts to the pre-dam elevations. The process of a rapid rate of channel incision into fine-grained deposited sediments described for Lake Pillsbury is unlikely to occur to the same extent in Van Arsdale Reservoir. There may be small amounts of fine sediment trapped within the coarse sediment deposit that would be suspended into the flow as the coarse sediment is eroded. There would be a small increase in suspended load resulting from this.

Eel River Downstream of Cape Horn Dam

The effects described downstream of Cape Horn Dam are largely based on sediment transport modeling performed by Stillwater Sciences for removal of Scott Dam. The modeling did not include removal of Cape Horn Dam. Some factors suggest that the predicted sediment transport and channel response described in the following sections would not be appreciably different if removal of Cape Horn Dam was also included in the analysis:

- Cape Horn Dam only has an estimated erodible sediment volume of 1.65 million $yd.^3$ of sediment, compared to 12 million $yd.^3$ of erodible sediment stored in Lake Pillsbury behind Scott Dam.
- The Van Arsdale Reservoir impounded sediment is predominantly sand and gravel based on one composite sample collected (Geosyntec 2000), and most of the reservoir was noted to have no visible fine sediments, but rather a stream bed composed of gravel, cobble, and boulders (Geosyntec 2000). Therefore, the sediment eroded from the reservoir would likely increase sand and gravel supply and create relatively lower additional silt and clay supply.

- The sediment supply in the Eel River downstream of Cape Horn Dam has not decreased to the same extent as the reach downstream of Scott Dam since it is hypothesized (Stillwater Sciences et al. 2021b) that most sediment supplied to the Eel River by Soda Creek and other smaller tributaries is transported through Van Arsdale Reservoir and over Cape Horn Dam based on the presence of active bars on the reservoir's inside bend and concrete abrasion on the east side of the dam.

Based on the Proposed Action, both Cape Horn Dam and Scott Dam would be lowered during the same construction season, and the bulk of the impounded sediment erosion would occur during the same high-flow events following dam removal. While this would create the potential for higher temporary increases in total sediment concentrations, the overall environmental effect may be lower than if the dams were removed in separate years since the duration of elevated sediment concentrations would be lower.

Fine-Grained Sediment Transport

As previously discussed, Stillwater Sciences (2021a) stated finer particles such as silt and clay would be transported as wash load downstream without re-deposition once entrained by the flow (Cui et al. 2006). However, the same caveats previously described apply to this reach as well.

The extent of fine-grained sediment deposition would be reduced downstream of Cape Horn Dam since flow inputs from major tributaries downstream of Cape Horn Dam, including Tomki Creek (4 mi. downstream, 64 mi.^{2} drainage area) and Outlet Creek (26 mi. farther downstream, 162 mi.^{2} drainage area), would diminish the effect of the elevated fine-grained sediment load. It is likely some of the suspended sediment delivered to the reach may deposit and alter channel or floodplain morphology, at least temporarily, until subsequent high-flow events can resuspend it and transport it farther downstream. The major input of flow and sediment from the Middle Fork Eel River (located 55 mi. downstream of Cape Horn Dam) would appreciably dilute the contribution of fine-grained sediment, and it may be difficult to detect a change from the existing condition once the spike in turbidity subsides in the days immediately following the dam removals.

Sand Transport

Downstream of Cape Horn Dam, the DREAM-1 sand transport model showed the thickness of the sand deposits would vary based on distance from Scott Dam and channel morphology. Some locations (e.g., pools) would experience high deposition while other reaches (e.g., riffles) would have little to no deposition (Stillwater Sciences 2021b). The model predicted a maximum sand deposit thickness of 3 ft. at RM 155 just downstream of Cape Horn Dam (RM 156.8) for a wet year scenario (see Figure C-18 in Stillwater Sciences 2021b) and 4 ft. for a dry year scenario (see Figure C-18 in Stillwater Sciences 2021b). The sand deposit thickness was 3.5 to 4 ft. thick as far downstream as RM 146, between the Salt Creek and Thomas Creek confluences. The maximum sand deposit thickness generally decreased to about 1.75 ft. at RM 129, with no modeled sand deposition downstream of RM 126 at the confluence with Outlet Creek and extending to the downstream end of the analysis at the Middle Fork Eel River confluence (see Figure C-18 in Stillwater Sciences 2021b). In the reach between Cape Horn Dam and the Middle Fork Eel River, prominent sand deposition at a given location was predicted to last for a few days to several weeks, depending on wet or dry conditions and the sequence of storm events, before being mobilized and transported farther downstream (Stillwater Sciences 2021b).

It is expected that sand deposition would temporarily adversely affect channel morphology. It would likely lead to partial or complete filling of pools and burial of coarse channel substrate that would diminish aquatic habitat. The elevated sediment deposition would be temporary as subsequent flood events through restored, unimpaired Eel River hydrology following the dam removals would remobilize most of the deposited sand and flush accumulated sediment from pools and coarse channel substrate.

Infrastructure Effects

The sediment deposition has the potential to impact infrastructure located downstream of Cape Horn Dam. The two bridges in the reach from Cape Horn Dam to the Middle Fork Eel River confluence that are predicted to experience increases in bed elevation from the DREAM-1 sand deposition modeling following Scott Dam removal are listed in Table 3.4.1.8-2. Details of the methods used to analyze the potential for sand impacts at the bridges are previously described for the reach from Scott Dam to Cape Horn Dam. Two bridges, Hearst-Willits Road Bridge and Eight Mile Bridge, are included in the reach downstream of Cape Horn Dam. The approximate distance from the Eel River channel bed thalweg to the low chord elevation at these bridges is approximately 30 ft. The maximum sand deposit thickness is 4 ft. at Hearst-Willits Road Bridge and 0.5 ft. at Eight Mile Bridge. Sand deposition is predicted to temporarily reduce conveyance capacity at the Eel River bridges, but the top elevations of the deposited sand are predicted to be well below the bridge decks (Table 3.4.1.8-2).

The same conclusions previously presented for the reach from Scott Dam to Cape Horn Dam apply to this reach:

1. Deposition of sand in the Eel River downstream of Cape Horn Dam would decrease conveyance capacity at the existing bridges until the accumulated sediment is transported downstream. Accounting for the predicted sediment deposition, at the 2-year event there would be ample freeboard remaining between the flood’s water surface elevation and the low chords of the bridges.
2. The reduced flood conveyance is not likely to apply to higher magnitude, less frequent flood events as the 5-year flood event is predicted to mobilize the majority of the accumulated sediment out of the reach, and all of the sediment would likely be flushed out during a 100-year event (Stillwater Sciences 2021c).

Even though the modeling suggests sedimentation would not be problematic for bridge infrastructure or increasing flood risk, given the inherent uncertainty in hydraulic and sediment transport modeling, it is feasible that sedimentation could create an adverse effect. Sediment deposition also has the potential to adversely impact other infrastructure along the river, such as water intakes or diversions, whereby they become buried or plugged and become inoperable or require ongoing management. The potential for an adverse effect in the reach downstream of Cape Horn Dam is less than in the reach between Scott Dam and Cape Horn Dam. To address and reduce the potential impacts to infrastructure, PG&E would develop and implement the Sediment/Channel Monitoring and Response Plan. The plan would include measures for monitoring potential sediment deposition and reductions in flow conveyance at the bridge locations that may occur during drawdown and notching of the dam. PG&E would also develop and implement the Flood Monitoring Plan, which will establish monitoring of water levels and flood risks, define measures to protect downstream infrastructure and surrounding areas, and define a process for addressing any potential issues. With implementation of these measures, potential effects to infrastructure from sand deposition are considered negligible.

Gravel Transport

The supply of gravel size and coarser sediment to the Eel River downstream of Cape Horn Dam would increase when Cape Horn Dam and Scott Dam are removed. The same uncertainties described for the reach between the two dams, including the total volume of increased coarse sediment and the rate it would be delivered into the reach and routed downstream, also apply to this reach.

A beneficial effect of removing Scott Dam and Cape Horn Dam is the currently over-coarsened sediment gradation in the reach would become less coarse with the renewed combined coarse sand and gravel supply. Long-term aggradation may occur that raises the bed elevation profile, though, as indicated by the DREAM-1 modeling, much of the sediment initially deposited would likely be remobilized in subsequent floods and transported farther downstream. More pronounced sediment bars would form that would promote development of a more sinuous channel. Areas with existing overly dense riparian vegetation due to flow and sediment regulation would be scoured more frequently or buried with sediment deposits, resulting in less dense vegetation. The nature of the changes would vary depending on the valley width and slope of a given sub-reach. Relatively wide and low-gradient reaches would experience more sediment deposition than narrower and steeper reaches.

The previously described flow and coarse sediment contributions from major tributaries downstream of Cape Horn Dam would diminish the effect of the elevated gravel load. It is likely that alterations to the existing channel morphology would become difficult to distinguish downstream of the confluence with the Middle Fork Eel River.

Downstream Restoration Project Effects

Several restoration projects have recently been implemented or are in progress in the lower Eel River (see Section 3.3.7). As discussed above and in Section 3.4.1.3, blasting of the adit and removal of Scott Dam will result in a large flush of sediment in the Eel River below Scott Dam. A very large flush of sediments would travel down the Eel River from Scott Dam and cause high turbidity along the entire Eel River to the ocean. As the highly turbid water travels down the Eel River to the mouth of the Eel River estuary, suspended sediments would be diluted from tributary inflows and some suspended sediment would settle out along the way in the riverbed, including in the estuary. These sediments will be remobilized with subsequent high-flow events, possibly over the course of several years, until they make their way out of the system. PG&E would implement the Estuary Protection Plan, which would include water quality monitoring in the estuary prior to, during, and after the dam removals and monitor for potential sedimentation in the estuary that may occur from removal of the dams, as well as define a process for developing additional measures, if needed. In addition, the timing of the removal of the dams would be designed to reduce any related potential impacts to sensitive species. While there will be an initial increase in turbidity and suspended sediment and the potential for deposition within the riverbed and estuary, the change to natural conditions with the removal of the dams, overall, is considered to be a beneficial effect on the Eel River and to downstream restoration projects. With implementation of these measures, potential effects to downstream restoration projects from sediment deposition are considered negligible.

Russian River Watershed

During the rapid removal of Scott Dam, minimum instream flows would continue to be released into the Eel River below Cape Horn Dam when flow is available, and natural flows would be passed when natural flows are less than the minimum flow. Removal of the dams would restore flows in the Eel River and East Branch Russian River to unimpaired natural conditions. No diversions would occur at the Van Arsdale Diversion/Cape Horn Dam. The potential geomorphic effect of a return to unimpaired hydrology in the East Branch Russian River is discussed in the Phase 2b resultant condition section below.

Elevated Suspended Sediment Concentrations

It is estimated that about 12 million yd.^{3} of the estimated 21 million yd.^{3} of total impounded sediment within Lake Pillsbury could potentially be mobilized downstream of Scott Dam following dam removal (Stillwater Sciences et al. 2021a) (also see Section 3.4.1.3).

Opening the large adit tunnel at the base of Scott Dam would initiate draining of the reservoir and rapid incision and erosion of the impounded sediment in Lake Pillsbury. This action is predicted to erode the majority of the bottom-set sediment deposit primarily composed of silt, clay, and fine sand over the course of several days (Stillwater Sciences 2021a). The modeled suspended sediment concentration is as high as 900,000 mg/L at a discharge of 5,000 cfs (Stillwater Sciences 2021a). This concentration is higher than what has been observed on some other dam removal projects (as reported below) but is not unprecedented. For example, the Condit Dam removal on the White Salmon River in Washington resulted in hyperconcentrated slurries with suspended sediment concentration (C_s with units of mg/L) levels up to 850,000 mg/L (32 percent sediment by volume). Sediment concentrations measured from previous dam removal projects are described below to provide context for the range of concentration magnitudes and durations that could occur on the Eel River.

Measured Sediment Concentrations from Other Dam Removals

Klamath River

USGS gage #11516530, Klamath River below Iron Gate Reservoir, measures flow discharge (cfs) and C_s[2] continuously at 15-minute intervals (see Figure 3.4.1.8-2). Prior to the dam removals, the C_s of the relatively clear water releases from Iron Gate Dam were typically less than 10 mg/L with a peak of approximately 70 mg/L. The discharge in early January, prior to the dam removal activities, was around 1,000 cfs and the C_s was around 1 mg/L. On January 27, 16 days after the gate at Iron Gate Dam was opened to initiate the sequence of dam removal events, the discharge at the gage reached its peak at 3,500 cfs, and on January 29 the C_s peaked at 7,290 mg/L. By mid-February (about a month after lowering of the reservoirs began), discharge returned to approximately 1,000 cfs and fluctuated between 1,000 cfs and 1,700 cfs until the end of the available gaging record in October 2024. The levels of suspended sediment concentrations did not decrease as quickly as discharge. From the peak of 7,290 mg/L, C_s levels gradually decreased to about 30 mg/L by late May, but then gradually increased again to nearly 5,000 mg/L in late August in response to cofferdam removals on August 28, 2024, at the former Iron Gate and Copco No. 1 dam sites. As of this writing, suspended sediment concentration records are only available through October 7, 2024. It is noted that the C_s levels in the Klamath River upstream of Iron Gate Dam likely greatly exceeded the levels measured downstream of Iron Gate Dam. A slurry flow was likely to have formed downstream of Copco No. 1 Dam after the rapid drawdown of Copco Reservoir and then largely deposited in Iron Gate Reservoir, which had not been fully drawdown yet.

USGS gage #11520500, Klamath River near Seiad Valley, is located about 63 mi. downstream of the Iron Gate gage (drainage area of 4,630 mi.^{2}) and has a drainage area of 6,940 mi.^{2}, which is a 50 percent increase in area compared to Iron Gate gage. For the measurement record prior to the dam removals, sediment concentrations at the Seiad Valley gage fluctuated widely with discharge, reaching typical lows of around 3 mg/L and highs of nearly 9,000 mg/L. Concentrations during low-flow periods were often around 20 mg/L. An increase in C_s levels from the Klamath River dam removals was observed in the Seiad Valley measurements, which had a similar pattern of rapid increase in January 2024 to approximately 4,000 mg/L, which was lower than peak concentrations measured during storm events prior to the dam removals.

[2] Suspended sediment concentration, water, unfiltered, estimated by regression equation, milligrams per liter [from an EXO2 multiparameter instrument]. Sediment concentration data is listed by the USGS as provisional and subject to revision.

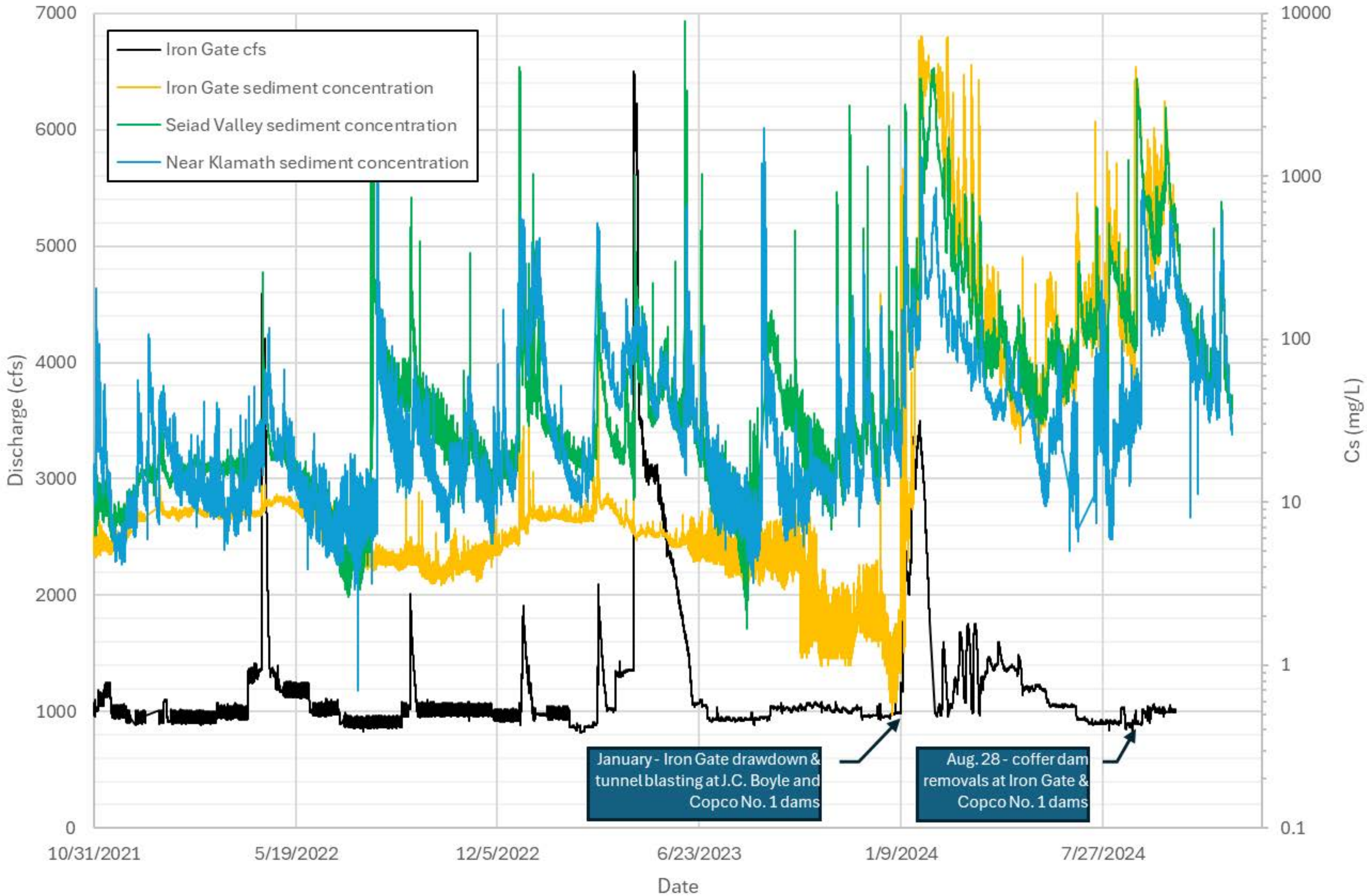


Figure 3.4.1.8-2. Klamath River suspended sediment concentrations and discharge at USGS gages in response to the dam removals.

The peak was followed by a gradual decrease to 40 mg/L by late May, but then steadily increased again to nearly 4,000 mg/L in late August 2024 in response to cofferdam removals. As of this writing, suspended sediment concentration records are only available through December 2, 2024, at which time the C_s levels were approximately 40 mg/L. This is similar to the typical C_s level of 20 mg/L prior to the dam removals (which are expected to have been unnaturally low due to former sediment impoundment at the upstream dams).

USGS gage #11530500, Klamath River near Klamath, is located about 122 mi. downstream of the Iron Gage gage (6 mi. from the ocean) and has a drainage area of 12,100 mi.^{2}, which is a 161 percent increase in area compared to the Iron Gate gage. For the measurement record prior to the dam removals, sediment concentrations at the Klamath gage fluctuated with discharge, reaching typical lows of around 5 mg/L and highs of 1,600 mg/L. Concentrations during low-flow periods were often around 20 mg/L. Sediment concentration increased to about 1,600 mg/L following the dam removals in January 2024. This level was not higher than levels measured during storm events prior to the dam removals. The C_s levels progressively decreased to about 10 mg/L by July 2024. Similar to measurements at both the Iron Gate and Seiad Valley gages, the C_s levels subsequently steadily increased to 700 mg/L in early September 2024 in response to cofferdam removals. As of this writing, suspended sediment concentration records were only available through December 2, 2024, at which time the C_s levels were approximately 40 mg/L, which is slightly above the typical C_s level of 15 mg/L prior to the dam removals.

Elwha River

The draining of water from Lake Mills at Glines Canyon Dam resulted in increases in C_s levels, typically less than 1,000 mg/L. Appreciable increases in sediment concentrations occurred when the reservoir delta sediment deposits prograded to the dam and began spilling sediment over the spillway. The C_s peaked at over 5,000 mg/L in May 2012 after Elwha Dam began spilling coarse sediment. The sediment concentrations increased markedly after prograding sediment began spilling over Glines Canyon Dam. The average daily concentration exceeded 1,000 mg/L for 214 days and exceeded 5,000 mg/L for 56 days cumulatively (Warrick et al. 2015). At the highest flow of approximately 7,500 cfs, C_s peaked at over 10,000 mg/L (Warrick et al. 2015). The spike in sediment concentrations adversely impacted a water treatment facility in the lower reach and led to a pause in the removal of Glines Canyon Dam to allow the Elwha River to redistribute sediment within the former Lake Mills and along the fluvial channels (East et al. 2015). Within the first 2 years of the dam removals, only approximately 4 percent of the eroded silt and clay sediment deposited in the river and 7 percent in the coastal system, with about 89 percent of the fine-grained sediment being transported far offshore of the delta due to the energetic coastal environment (Warrick et al. 2015).

Condit Dam – White Salmon River

At Condit Dam, the rapid drawdown, combined with the predominantly fine-grained reservoir sediment, resulted in hyperconcentrated slurries with C_s levels up to 850,000 mg/L (32 percent sediment by volume) that lasted about 2 hours (Wilcox et al. 2014). Within 15 weeks after blasting, it is estimated that more than 60 percent of the impounded sediment had eroded. Most of the sediment eroded from the reservoir was transported downstream as suspended load. Wilcox et al.

(2014) state that hyperconcentrated flows similar to those that occurred at Condit Dam could occur at other dam removals where impounded reservoir sediment is fine-grained, deposits are thick and impoundments deep, and the dam is breached rapidly.

Implications for the Eel River

Although the coastal environment at the mouth of the Eel River is not directly comparable to the Elwha River's, it is expected that most of the Eel River's fine-grained silt and clay sediment would be transported as wash load downstream without re-deposition once entrained by the flow. However, it is likely some of the fine sediment would deposit within the interstitial spaces of coarser substrate and on the channel margins and floodplain, thus altering channel or floodplain morphology, at least temporarily until subsequent high-flow events could resuspend it and transport it farther downstream.

One rationale for the Proposed Action rapid dam removal approach is that it would limit the duration of elevated turbidity and suspended sediment concentrations that would likely be detrimental to aquatic organisms downstream. In other words, the rapid removal approach would likely lead to higher concentrations compared to a staged removal approach (e.g., Elwha River), but the adverse effect would not last as long.

Removing Scott Dam and Cape Horn Dam will have a short-term unavoidable adverse effect on suspended solids and turbidity in the Eel River for a period of several days up to several months for which no mitigation is possible. This effect is likely to extend along the entire length of the Eel River down to the mouth of the Eel River estuary. This action will also have a smaller long-term effect of increased turbidity during high-flow events as the remainder of the sediments are mobilized and carried out to the ocean. PG&E will implement the Post-Construction Water Quality and Water Temperature Monitoring Plan. This plan will include monitoring of water quality, including turbidity, and define appropriate response actions. PG&E would also implement the Sediment/Channel Monitoring and Response Plan. This plan will include measures to monitor channel conditions and define appropriate response actions. In addition, PG&E would implement the Estuary Protection Plan, which will include measures to monitor turbidity in the estuary.

Spill through Notched Scott Dam Spillway

At the completion of Lake Pillsbury's drawdown in October, the dam crest elevation would be lowered nearly 40 ft. and a large notch (10–15 ft. deep and 150–200 ft. wide; overall discharge capacity between 15,000–40,000 cfs depending on head) would be constructed in the spillway. This capacity would be in addition to the 7,000 cfs capacity of the adit tunnel.

The previous discussion of expected channel sedimentation from coarse sediment transport and deposition modeling (Stillwater Sciences 2021b) includes a wet year scenario simulation that starts January 3, 1995, with unimpaired mean daily discharge of 329 cfs and then a rapid increase to 24,046 cfs for a few days (approximately 10 percent exceedance probability).

The potential exists for a large storm to deliver high runoff into Lake Pillsbury that exceeds the 24,046 cfs peak of the sediment model during the removal of Scott Dam, while the dam's crest is lowered and notched. At USGS gage #11470500, Eel River below Scott Dam, which measures impaired flows, for 101 years of records from 1923 through 2023 there have been 11 different years in which the maximum mean annual discharge for the year exceeded 24,046 cfs (up to as high as 45,300 cfs on December 22, 1964). If such an event occurred, the erosion of impounded sediment, and the erosion of and deposition in the Eel River downstream, could be greater than predicted by the sediment modeling.

Phase 2b: Resulting Condition and Restoration

Reestablishment of Sediment Supply

Removal of Scott Dam would restore unimpaired hydrology and increase the contributing drainage area and sediment supply for the Eel River downstream of the dam. For example, at Cape Horn Dam, the existing drainage area contributing coarse sand and gravel would increase from 56 mi.^{2} to 345 mi.^{2} post-removal (Stillwater Sciences 2021b). The sand sediment supply is estimated to increase from 11,830 ton/year to 72,860 ton/year downstream of Scott Dam (Stillwater Sciences 2021b). Stillwater Sciences (2021b) ran the DREAM-1 sand transport model for a 10-year simulation to simulate long-term transport and deposition conditions in the Eel River following Scott Dam removal. Based on the analysis, which assumed removal of Scott Dam but not Cape Horn Dam, the maximum reach-averaged amount of sand predicted to accumulate during periods with low flood flows is an increase from 6 in. with Scott Dam in place to approximately 3 ft. with Scott Dam removed, focused primarily within Van Arsdale Reservoir. The accumulated sand would then be flushed downstream during larger floods (see Figure 25 in Stillwater Sciences 2021b). Minimal sand deposition was predicted between Cape Horn Dam and the Middle Fork Eel River confluence (the predicted maximum was less than 4 in. and should be interpreted as no significant additional sand deposition in this reach) (Stillwater Sciences 2021b).

Stillwater Sciences (2021b) also commented that if a gravel transport model were developed, the predicted combined sediment deposition would not simply be the sum of simulated sand deposition and simulated gravel deposition. Rather, the total combined gravel and sand deposition would likely be only slightly higher than the simulated sand deposition since the deposition of gravel would largely displace rather than add to the deposited sand.

Removal of Cape Horn Dam is not expected to appreciably change the long-term sediment supply since the reservoir currently has a low trap efficiency, with most incoming sediment transported through the impoundment and past Cape Horn Dam (PG&E 2005; Stillwater Sciences et al. 2021a). However, removal of Cape Horn Dam would likely slightly reduce the above reported increase in long-term sand deposition in the reach upstream of the dam since the Eel River channel slope and sediment transport capacity within Van Arsdale Reservoir would increase compared to the assumptions used in the DREAM-1 model with Cape Horn Dam in place.

As described in the following section, implementation of the Proposed Action and reestablishment of sediment supply would have a beneficial effect on the geomorphic processes and form of the Eel River.

Reestablishment of Geomorphic Processes and Form

As the Eel River and tributaries downcut into the impounded sediment within Lake Pillsbury and Van Arsdale Reservoir, it could take many years until the resultant channel morphology resembles its pre-dam condition. Ideally, natural fluvial processes would do most of the work to restore channel form, and direct action would be limited. There is the potential that following the adit demolition and dam removal large volumes of sediment remain in the reservoir bed that may adversely affect resultant channel and floodplain morphology, including the potential for instabilities in the channel profile that may affect fish passage or increase channel instability.

If large volumes of sediment remain in the reservoir bed that may adversely affect channel form and fish passage, PG&E would develop measures included in the Restoration Plan, including a process for identifying and implementing measures, perhaps using mechanical means, to maximize sediment erosion over a condensed duration. The Restoration Plan would define a process for identifying and implementing measures to remove the fish passage impediments or barriers and improve hydraulic connectivity. The Restoration Plan would also include measures for identifying and implementing measures to stabilize residual sediments, including seeding or planting to encourage native plant establishment and provide soil cover and erosion protection. PG&E would also develop and implement the Sediment/Channel Monitoring and Response Plan to identify locations where natural fluvial processes are not eroding as much sediment as anticipated and may adversely affect resultant channel and floodplain morphology; locations where there may be ongoing issues with bank instability and channel incision that may adversely affect habitat and fish passage; and locations within Lake Pillsbury where unvegetated and unstable surfaces are forming that would require stabilization measures.

The anticipated geomorphic response of the Eel River for the different reaches is discussed below.

Lake Pillsbury Area

Channel morphologies that evolve in the locations currently buried under Lake Pillsbury sediment would likely resemble reaches observed upstream and downstream of Lake Pillsbury, although they would not exhibit characteristics of flow and sediment regulation (e.g., overly coarse substrate, minimal sediment bars, dense riparian vegetation that constricts the channel) observed downstream of Scott Dam and Cape Horn Dam.

The estimated channel slopes of the mainstem Eel River and its primary tributaries that form in the former Lake Pillsbury are presented below. The channel slopes were estimated from the channel longitudinal profiles created from the 1921/1922 pre-dam bathymetry (Figure 8 in Stillwater Sciences 2021b and profiles in California Trout et al. 2021). The analysis assumes the channel elevations return to similar elevations as those in 1921/1922. Based on general relationships developed for channel reach morphology and slope (Montgomery and Buffington 1997), the channels that return to pre-dam slopes of less than approximately 1.5 percent may exhibit pool and riffle morphology and slopes greater than 1.5 percent may develop into plane-bed channels with relatively coarser substrate.

Mainstem Eel River Upstream of the Rice Fork

The mainstem Eel River for the first 12,270 ft. upstream of Scott Dam has a 0.27 percent slope. The slope steepens to 0.60 percent for the next 2,150 ft. and then steepens appreciably to 2.08 percent for a relatively short 475-ft.-long reach. For the uppermost 3,100 ft. of the channel profile within Lake Pillsbury, the channel slope decreases to 0.16 percent.

Rice Fork

From an initial station located 1,400 ft. upstream of Scott Dam, the Rice Fork for the first 1,430 ft. extending upstream has a 0.15 percent channel slope. The slope steepens to 0.44 percent for the next 6,800 ft. and then steepens appreciably to 1.83 percent for the final 1,090 ft. of the profile.

Salmon Creek

From an initial station located 1,600 ft. upstream of Scott Dam, Salmon Creek for the first 1,770 ft. extending upstream has a 0.14 percent channel slope. The slope steepens to 0.70 percent for the final 12,170 ft. of the profile.

Squaw Valley Creek

From an initial station located at the confluence with the mainstem Eel River, Squaw Valley Creek for the first 800 ft. extending upstream has a 0.13 percent channel slope. The slope steepens to 1.19 percent for the next 3,200 ft. and then decreases to 0.72 percent for the final 5,800 ft. of the profile.

Horsepasture Gulch

From an initial station located at the confluence with the mainstem Eel River, Horsepasture Gulch for the first 2,800 ft. extending upstream has a 1.29 percent channel slope. The slope steepens to 3.00 percent for the next 200 ft. of the profile.

Eel River—Scott Dam to Cape Horn Dam

The increased supply of coarse sediment would be accompanied by a return to unimpaired hydrology once Scott Dam is removed. This would increase the magnitude, frequency, and duration of flood events necessary to do geomorphic work and maintain a dynamic channel. For example, it is predicted that the 2-year recurrence interval event would increase by 38 percent, from 7,420 cfs to 10,242 cfs, at Scott Dam (refer to Section 3.3.1, Table 3.3.1-8).

When the sediment load stabilizes in the years following Scott Dam removal, the Eel River morphology in this reach would likely resemble current conditions upstream of Lake Pillsbury, including a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less dense riparian vegetation (Stillwater Sciences et al. 2021b).

Van Arsdale Reservoir and Cape Horn Dam Area

The reach of the Eel River currently buried under sediment impounded by Cape Horn Dam is expected to return to a morphologic condition similar to pre-dam conditions and as described for the upstream reach nearer Scott Dam. An exception would be the short segment of the Eel River that would be converted into the proposed control section with the NERF pump station. The channel elevations would be stabilized in this area to facilitate water diversions to the NERF pump station and to provide fish passage. The structure would be designed to allow sediment transported from upstream to continue unimpeded downstream past the structure.

The river would become a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less dense riparian vegetation. The length of time required for a return to this condition may be a few to several years and would be largely dependent on the magnitude, frequency, and duration of subsequent flood events.

Eel River Downstream of Cape Horn Dam

As described for the river reach downstream of Scott Dam, when the sediment load stabilizes in the years following Cape Horn Dam removal, the Eel River morphology in this reach would likely include a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools, and less dense riparian vegetation. Removal of Scott Dam and Cape Horn Dam would increase the magnitude, frequency, and duration of flood events necessary to do geomorphic work and maintain a dynamic channel. For example, it is predicted that the 2-year recurrence interval event would increase by 36.4 percent from 8,962 cfs to 12,221 cfs, at Cape Horn Dam (refer to Section 3.3.1, Table 3.3.1-10).

The change in channel-forming flows, such as the 2-year event, would diminish farther downstream in the Eel River Watershed. For example, at USGS gage #11475000, Eel River at Fort Seward, located downstream of the confluence with the North Fork Eel River, it is predicted that the 2-year recurrence interval event would increase by only 6.3 percent, from 70,567 cfs to 74,988 cfs (refer to Section 3.3.1, Table 3.3.1-12).

Implementation of the Proposed Action would have a beneficial effect on the geomorphic processes and form of the Eel River for the above-described reaches.

Potential Increases in 100-Year Flood Elevations

Pioneer Bridge, roads, and other infrastructure around Van Arsdale Reservoir are outside the estimated 100-year flood inundation extents (Stillwater Sciences 2021c). Currently, Pioneer Bridge's total vertical freeboard measured from the Eel River thalweg is 35 ft. and is 11 ft. at the modeled 100-year flood (Stillwater Sciences 2021c). It is predicted that the 100-year recurrence interval event would increase by 4.8 percent at Scott Dam, from 45,300 cfs to 47,469 cfs, and would increase by 4.3 percent at Cape Horn Dam, from 50,087 cfs to 52,256 cfs (refer to Section 3.3.1, Table 3.3.1-10). A 4.3 percent to 4.8 percent increase in discharge for the 100-year flood would not significantly reduce the available freeboard at the bridges.

As stated above, the long-term analysis of a 10-year period representative of post-Scott Dam removal conditions showed the maximum reach-averaged amount of sand predicted to accumulate during periods with low flood flows would be an increase from the current 6 in. with Scott Dam in place to approximately 3 ft. with the removal of Scott Dam (Stillwater Sciences 2021b). Since the accumulated sand would be flushed downstream during subsequent larger floods, it is unlikely the additional sand would adversely increase the 100-year flood risk (Stillwater Sciences 2021c). The risk would be even lower with removal of Cape Horn Dam and lowering of Eel River channel elevations after impounded sediment is transported downstream.

An increase in gravel transport rates throughout the system is expected as the natural supply of gravel would no longer be trapped behind Scott Dam. However, the measurable changes to bed elevation due to removal of Scott Dam are expected be primarily in the first 10 mi. downstream of Scott Dam (Stillwater Sciences 2021b). Increases in bed elevations that do occur would likely restore bed elevations to similar conditions prior to degradation from trapping of gravel and cobble in Lake Pillsbury.

To address and reduce the potential impacts to infrastructure, PG&E would develop and implement the Sediment/Channel Monitoring and Response Plan. The plan would include measures for monitoring potential sediment deposition and reductions in flow conveyance at the bridge locations that may occur during drawdown and notching of the dam. PG&E would also develop and implement the Flood Monitoring Plan, which will establish monitoring of water levels and flood risks, define measures to protect downstream infrastructure and surrounding areas, and define a process for addressing any potential issues. With implementation of these measures, and given the available freeboard at the bridges, potential effects to infrastructure from sand deposition during construction are considered negligible.

Potential Increased Sediment Concentration and Sand and Gravel Transport at the NERF

Clear-water releases from Scott Dam kept sediment concentrations in the reach downstream of the dam relatively low compared to what they would be without impoundment of flow and sediment in Lake Pillsbury. The reestablishment of sand and gravel supply following Scott Dam removal would increase sediment concentrations and transport of sand and gravel in the reach that includes the NERF. As previously described, removal of Scott Dam and reestablishment of the sediment supply is estimated to increase sand supply from 11,830 ton/year to 72,860 ton/year downstream of Scott Dam (Stillwater Sciences 2021b). The supply of gravel would also be increased. Much of the increased gravel supply is predicted to initially deposit not much farther downstream than the low-gradient channel reach within the first 2 mi. of Scott Dam (Stillwater Sciences 2021b), but in the long-term the increased gravel supply would eventually result in increased gravel transport past the pump station. In addition to increased sediment loads and concentrations, the Eel River would be more dynamic in this reach. Increased sediment bars would form that could shift in location over time, thus shifting the location of the low-flow channel.

Potential East Branch Russian River Channel Response to Altered Flows

As discussed in Section 3.4.1.2, following removal of Scott Dam, natural (unimpaired) hydrology would pass through the Eel River downstream to Cape Horn Dam. Stored water would not be present to maintain the current Reasonable and Prudent Alternative minimum instream flows in the Eel River or the East Branch Russian River when the natural hydrology is not sufficient to meet those requirements, and flow would no longer be diverted to the East Branch Russian River after removal of Scott Dam. This would have the potential to alter geomorphic processes and form in the East Branch Russian River.

Diversion of Eel River flow to the East Branch Russian River has increased flows in the East Branch Russian River compared to what they were under the unimpaired condition. Table 3.3.1-17 in Section 3.3.1 lists unimpaired (no diversions) and impaired (with diversions) flood frequency flows in the East Branch Russian River at USGS gage #11461500 near Calpella, California, for water years 1942 to 2017. The drainage area at the gage is 92.2 mi.^{2}. For comparison, the drainage area of the East Branch Russian River upstream of Lake Mendocino and Cold Creek is approximately 73 mi.^{2}. For the 2-year through 50-year events, the peak flow for the impaired condition would be reduced by 4.8 percent to 8.4 percent for the unimpaired condition. The difference would be more appreciable for the 1-year event, in which the unimpaired flow (74 cfs) is 76.2 percent less than the impaired flow (311 cfs).

The geomorphic and riparian condition along the East Branch Russian River has evolved to the impaired flow condition over the century. Relatively large and infrequently occurring floods, such as the 2-year and higher flow events, are often important for geomorphic processes that maintain channel form, such as flushing sediment from pools, controlling vegetation encroachment into the channel through bed scour and vegetation uprooting or burying with bar sediment deposition, and bank erosion. The reduction in peak flow for the 2-year and higher flow events of about 6 percent would cause a small reduction in these channel-forming processes but would be unlikely to cause pronounced channel narrowing or other geomorphic change to occur. The large reduction in the 1- to 1.5-year flood may result in less frequent mobilization of sediment that could increase the duration for which fines accumulate in pools before being flushed out by a flood. Similarly, new vegetation could start to become more established on bars and channel margins. These potential effects are considered to have a negligible effect; however, since large flood flows would still occur on the East Branch Russian River under the Proposed Action, changes to geomorphic process that do occur would cause the river to adjust in geomorphic form to a condition more similar to its unimpaired, natural condition prior to receiving increased flows from Eel River diversions.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam in the same year. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (see Section 3.4.1.1). This section discusses how the two options could create different geomorphic effects.

Scott Dam Removed Prior to Cape Horn Dam

This is the sequencing option that most closely aligns with much of the analysis presented in preceding sections. The predicted extent and thickness of coarse sediment deposition from Stillwater Sciences' (2021b) coarse sediment transport modeling assumed Cape Horn Dam and Van Arsdale Reservoir's impounded sediment was still in place. With Cape Horn Dam still in place when Scott Dam is removed, much of the coarse sediment eroded from Lake Pillsbury would deposit within Van Arsdale Reservoir. However, as previously stated, it is hypothesized (Stillwater Sciences et al. 2021b) that under current conditions, most sediment supplied to the Eel River by Soda Creek and other smaller tributaries is transported through Van Arsdale Reservoir and over Cape Horn Dam based on the presence of active bars on the reservoir's inside bend and concrete abrasion on the east side of the dam. If this is the case, then a portion of the sediment from Lake Pillsbury would also be transported over Cape Horn Dam. This is supported by the modeling of Scott Dam removal that showed maximum sand deposition occurred upstream of Cape Horn Dam, but sand also deposited downstream of Cape Horn Dam, and the majority of the accumulated sediment upstream of Cape Horn Dam is predicted to be mobilized out of the reach by a subsequent 5-year flood event. The sediment that does deposit upstream of Cape Horn Dam would need to then be excavated from the Cape Horn Dam work zone prior to the removal of the dam. This would potentially include removal of sediment deposited at the fish ladder and at the Van Arsdale Diversion Intake.

No specific modeling has been performed to evaluate the erosion and transport of Van Arsdale Reservoir sediment. The erosion of Van Arsdale Reservoir sediment would be limited to the unimpaired hydrology that would occur after removal of Scott Dam. Notching of Scott Dam's spillway is predicted to create a discharge capacity of 15,000 to 40,000 cfs depending on Lake Pillsbury's head. Based on the unimpaired hydrology at Scott Dam (see Table 3.3.1-8 in Section 3.3.1), these flows have respective recurrence intervals of about 4 years and 75 years. Without Scott Dam in place, the volume of sediment eroded from Van Arsdale Reservoir in the years immediately following Cape Horn Dam removal could be less than with a notched Scott Dam since the unimpaired flows could be less than the 15,000 to 40,000 cfs range. If this scenario were the case, it is likely that eventually the unimpaired hydrology would still erode a similar volume of Van Arsdale Reservoir sediment, but it may take a longer time for this to occur.

If Cape Horn Dam is not removed at the same time as Scott Dam, then elevated suspended sediment concentrations and turbidity would occur over two different periods rather than concentrated into a relatively shorter time period. However, as previously described, the much lower volume of sediment estimated to be eroded from Van Arsdale Reservoir compared to Lake Pillsbury, combined with the relatively low silt and clay content within Van Arsdale Reservoir sediment, indicates that the effect of removing Cape Horn Dam would be appreciably less than that of removing Scott Dam.

Scott Dam Removed After Cape Horn Dam

Removal of Cape Horn Dam prior to Scott Dam would enable proposed mechanical excavation as well as some fluvial erosion of Van Arsdale Reservoir's sediment to occur prior to erosion of Lake Pillsbury's sediment. The increased slope of the Eel River through the Van Arsdale Reservoir reach would have the effect of increasing the sediment transport capacity of the reach and enabling additional transport of Lake Pillsbury's sediment through the reach once Scott Dam is removed. The modeled sand deposition within Van Arsdale Reservoir due to removal of Scott Dam would be lower than modeled since the model assumed Cape Horn Dam was in place. As stated above, however, the modeling also indicates that Lake Pillsbury sediment deposited within Van Arsdale Reservoir would be temporary and would be mobilized out of the reach by a subsequent 5-year flood event. This sequencing option could reduce the potential adverse effect of sedimentation causing conveyance capacity and flood risk concerns at the bridges upstream of Cape Horn Dam.

If Cape Horn Dam was removed in a year prior to the removal of Scott Dam, when Scott Dam is removed, sediment eroded from Lake Pillsbury may bury or partially bury the NERF intake to divert Eel River flow to the Russian River Watershed. This assumes the NERF was constructed at the same time as the Cape Horn Dam decommissioning. Additional excavation may be required to remove deposited sediment at the intake, and the deposition may be so extensive that the NERF would be temporarily inoperable. Elevated sediment/turbidity could also be diverted to the East Branch Russian River via the NERF diversion.

This sequencing option would also elevate suspended sediment concentrations and turbidity levels over two different periods rather than being concentrated into a relatively shorter time period if both dams were removed in the same season. Removal of Cape Horn Dam first could reduce the potential for silt and clay deposition to occur upstream of the dam because of the increased transport potential through the reach.

Construction and Environmental Measures

Short-Term Construction (Phase 1)

To avoid or reduce effects to geomorphic processes and form during construction, PG&E would obtain, prepare, and/or implement the following measures. A complete list of construction and environmental measures is included in Section 2.2.3.

- Construction BMPs
- SWPPP
- Construction Water Quality and Water Temperature Monitoring Plan
- Sediment/Channel Monitoring and Response Plan
- Construction Erosion Prevention Plan
- Construction Site Water Diversion, Dewatering, and Drawdown Plan
- Flood Monitoring Plan

- East Branch Russian River Diversion Plan
- Restoration Plan
- Adherence to measures included in following permits:
  - U.S. Army Corps of Engineers Section 404 Clean Water Act Permit
  - State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification

Post-facility Removal (Phase 2)

To reduce potential effects to geomorphic processes and form post-facility removal (Phase 2), PG&E would continue to implement the same environmental measures described above for Phase 1. In addition, PG&E would prepare and implement the following environmental measures. A complete list of construction and environmental measures is included in Section 2.2.3.

- Estuary Protection Plan
- Sediment/Channel Monitoring and Response Plan, which will include the following:
  - Bridges: monitor sediment deposition to assess for problematic levels of flow conveyance reduction and monitor for potential scour at bridges in the event of a large flow from notching Scott Dam.
  - Water Intakes or Diversions: monitor any structures that could become inoperable due to potential sediment deposition or scour.
  - Floodplains and Terraces: monitor potential sedimentation that extends beyond the channel and into higher elevation surfaces with land uses incompatible with sediment deposition.
- Post-Construction Water Quality and Water Temperature Monitoring Plan
- Restoration Plan

Unavoidable Adverse Effects

Implementation of the Proposed Action would result in the following unavoidable adverse impacts.

Phase 1: Short-Term Construction

There are no other unavoidable adverse effects to geomorphic processes and form as a result of Project facility modifications to be implemented under the Proposed Action during the construction period.

Phase 2a: Initial Condition and Preliminary Restoration

Unavoidable adverse effects related to water quality, including sediment concentrations and turbidity, are described in Section 3.4.1.3.

Unavoidable adverse effects to geomorphic processes and form include the following:

- Temporary alteration of Eel River channel and/or floodplain morphology from sediment deposition after deconstruction of the dams until subsequent high-flow events can resuspend the sediment and transport it farther downstream;
- Potential short-term adverse effects to bridge infrastructure located downstream of Scott Dam and Cape Horn Dam from sediment deposition; and
- Potential short-term adverse effects to other infrastructure along the river, such as water intakes or diversions being buried or plugged and becoming inoperable or requiring ongoing management due to sediment deposition.

Phase 2b: Resulting Condition and Restoration

There are no long-term unavoidable adverse effects to geomorphology.

References

Brownlie, W.R. 1982. Prediction of flow depth and sediment discharge in open channels. Ph.D. thesis, California Institute of Technology, Pasadena, CA.

California Trout, Stillwater Sciences, McBain Associates, and McMillen Jacobs Associates. 2021. Potter Valley Project technical studies: Lake Pillsbury sediment management discussion. PowerPoint presentation, January 14, 2021.

Cui, Y., G. Parker, C. Braudrick, W.E. Dietrich, and B. Cluer. 2006. Dam Removal Express Assessment Models (DREAM). Journal of Hydraulic Research 44(3):291–307. Available at: https://doi.org/10.1080/00221686.2006.9521683.

Draut, A.E., and A.C. Ritchie. 2015. Sedimentology of new fluvial deposits on the Elwha River, Washington, USA, formed during large-scale dam removal. River Research and Applications 31(1):42–61.

East, A.E., G.R. Pess, J.A. Bountry, C.S. Magirl, A.C. Ritchie, J.B. Logan, T.J. Randle, M.C. Mastin, J.T. Minear, J.J. Duda, M.C. Liermann, M.L. McHenry, T.J. Beechie, and P.B. Shafroth. 2015. Large-scale dam removal on the Elwha River, Washington, USA: River channel and floodplain geomorphic change. Geomorphology 228:765–786.

Geosyntec. 2020. Sediment investigation report – Lake Pillsbury and Van Arsdale Reservoir, Northern California. Prepared for California State Coastal Conservancy.

Gathard Engineering Consulting. 2006. Klamath River Dam and sediment investigation. Final report. November 2006.

McMillen Jacobs Associates. 2021. Scott Dam and Cape Horn Dam removal alternatives. Prepared for Two-Basin Solution Partners.

Montgomery, D.R., and J.M. Buffington. 1997. Channel-reach morphology in mountain drainage basins. Geological Society of America Bulletin 109(5):596–611.

PG&E (Pacific Gas and Electric Company). 2005. Potter Valley Project (FERC No. 77) Van Arsdale Reservoir sedimentation investigation report. Report No. 026.11-05.17. August.

Porterfield, G., and C. Dunnam. 1964. Sedimentation of Lake Pillsbury, Lake County, California. Geological Survey Water-Supply Paper 1619-EE. April.

Randle, T.J., J.A. Bountry, A. Ritchie, and K. Wille. 2015. Large-scale dam removal on the Elwha River, Washington, USA: Erosion of reservoir sediment. Geomorphology 246:709–728.

Ritchie, A.C., J.A. Warrick, A.E. East, C.S. Magirl, A.W. Stevens, J.A. Bountry, T.J. Randle, C.A. Curran, R.C. Hilldale, J.J. Duda, G.R. Gelfenbaum, I.M. Miller, G.R. Pess, M.M. Foley, R. McCoy, and A.S. Ogston. 2018. Morphodynamic evolution following sediment release from the world's largest dam removal. Scientific Reports 8(1):13279.

Stillwater Sciences. 2021a. Analyses of fine sediment erosion following the proposed Scott Dam removal, Eel River, California. Prepared for Two-Basin Solution Partners. July.

Stillwater Sciences. 2021b. Analyses and preliminary modeling of sediment transport following the proposed Scott Dam removal, Eel River, California. Technical memorandum. Prepared for Two-Basin Solution Partners. November.

Stillwater Sciences. 2021c. Hydraulic model development and potential flood implications following the proposed Scott Dam removal, Eel River, California. Technical memorandum. August 2021.

Stillwater Sciences, McBain Associates, McMillen Jacobs Associates, M.Cubed, Princeton Hydro, and Geosyntec Consultants. 2021a. Potter Valley Project feasibility study: capital improvements. Prepared by Stillwater Sciences and McBain Associates, Arcata, California; McMillen Jacobs Associates, Boise, Idaho; M.Cubed, Davis, California; Princeton Hydro, South Glastonbury, Connecticut; and Geosyntec Consultants, Oakland, California, for the Potter Valley Project Planning Agreement Parties.

Stillwater Sciences, McBain Associates, McMillen Jacobs Associates, M.Cubed, Princeton Hydro, and Geosyntec Consultants. 2021b. Potter Valley Project feasibility study: potential ecosystem and fisheries responses to project alternatives. Working draft technical memorandum prepared by Stillwater Sciences and McBain Associates, Arcata, California; McMillen Jacobs Associates, Boise, Idaho; M.Cubed, Davis, California; Princeton Hydro, South Glastonbury, Connecticut; and Geosyntec Consultants, Oakland, California, for the Potter Valley Project Planning Agreement Parties.

U.S. Bureau of Reclamation. 2012. Hydrology, hydraulics and sediment transport studies for the Secretary's determination on Klamath River dam removal and basin restoration. Technical report no. SRH-2011-02. Prepared for Mid-Pacific Region, U.S. Bureau of Reclamation, Technical Service Center, Denver, CO.

USSD (U.S. Society on Dams). 2015. Guidelines for dam decommissioning projects. Prepared by the U.S. Society on Dams Committee on Dam Decommissioning.

Warrick, J.A., J.A. Bountry, A.E. East, C.S. Magirl, T.J. Randle, G. Gelfenbaum, A.C. Ritchie, G.R. Pess, V. Leung, and J.J. Duda. 2015. Large-scale dam removal on the Elwha River, Washington, USA: Source-to-sink sediment budget and synthesis. Geomorphology 246:729–750.

Wilcox, A.C., J.E. O'Connor, and J.J. Major. 2014. Rapid reservoir erosion, hyperconcentrated flow, and downstream deposition triggered by breaching of 38 m tall Condit Dam, White Salmon River, Washington. Journal of Geophysical Research: Earth Surface 119(6):1376–1394. https://doi.org/10.1002/2013jf003073

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

BMP	best management practice
CAL FIRE	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
MNF	Mendocino National Forest
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
USFS	U.S. Forest Service
W&SR	Wild and Scenic River

This Page Intentionally Left Blank

3.4.1.9 Land Use

This section describes the potential effects to land use that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the changes in land use that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider construction measures and post-facility measures included to avoid or mitigate impacts associated with the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential short-term effects to land use resulting from Project facility modifications during the construction phase were evaluated:

- Changes in land use from the development of construction work areas and staging areas and removal of recreation facilities and other ancillary facilities;
- Potential fire risk during construction; and
- Potential damage to roads as a result of construction activities.

Potential construction effects would be similar in the Scott Dam and Cape Horn Dam areas and are therefore discussed together. There would be no potential effects from short-term construction activities on the Eel River or East Branch Russian River watersheds, and therefore, these are not discussed further below.

Scott Dam and Cape Horn Dam Areas

Changes in Land Use from the Development of Construction Work Areas and Staging Areas and Removal of Recreation Facilities and Other Ancillary Facilities

The construction area for Scott Dam and Cape Horn Dam removals and associated facilities/features includes all areas necessary for construction, including the construction work area, site access improvements, staging areas, and stockpile areas (see Tables 2-9 and 2-10 for a summary of the decommissioning of Project facilities and features in the Scott Dam and Cape Horn Dam areas). The development of these staging areas would temporarily alter the land use to construction for the duration of construction actions. For the recreation facilities and construction work areas within the Federal Energy Regulatory Commission (FERC) Project boundary, PG&E would be subject to the terms and conditions outlined in the existing license for the Project. For construction activities outside the FERC Project boundary, if necessary, PG&E would obtain appropriate authorization from the landowner.

All Project recreation facilities, except Trout Creek and the associated access roads which will be transferred to a third party, (i.e., campgrounds and day-use areas), ancillary facilities, and associated access roads would be removed. Construction and removal activities are anticipated to last for approximately 2 years in duration depending on site conditions. After removal and construction actions have been completed, Project recreation facility sites and associated construction work areas, staging areas, and stockpile areas would be restored, as described in the Restoration Plan. The use of these areas for recreation and transportation would cease as the areas are restored to natural conditions.

To reduce potential land use effects from construction and facility removal activities, PG&E would implement best management practices (BMPs), including limiting work, staging, and stockpile areas to minimize disturbance and limiting locations of access and staging to currently developed routes and previously disturbed areas to the extent practical.

PG&E would implement the Construction Recreation Plan that will include public notification measures at Project recreation sites, which would include announcements and postings of the Project construction schedule and closure areas, along with educational signage that informs communities about Project activities.

Impacts to land use from construction work and staging areas, and from removal of recreation facilities and other ancillary facilities, would be negligible with implementation of the Restoration Plan, BMPs, and implementation of conditions contained within the Forest Service Use Permit.

Other potential effects from construction activities, such as impacts to traffic, noise, and water quality, are discussed in other sections (see Section 3.4.1.18, Traffic; Section 3.4.1.17, Noise; and Section 3.4.1.3, Water Quality).

Potential Fire Risk during Construction

Construction sites are subject to fire risks from the use of combustible fuels and ignition sources from equipment. A fire that occurs during construction can result in injury to workers; structural damage; destruction of machinery, equipment, or materials; and a delay in Project completion.

To ensure safety and avoid or minimize the risk of fire during construction activities, a Construction Fire Plan would be created, which would outline strategies for fire prevention, detection, and response, ensuring that all personnel are trained and equipped to handle potential fire hazards effectively. This plan would be implemented in addition to PG&E's standard protocols. PG&E actively implements measures to prevent fires on Project lands in accordance with Article 27 from the FERC license and various internal PG&E standards, including EMER-4102S (formerly TD-1464S) – Preventing and Mitigating Fires While Performing PG&E Work. These plans include specific procedures that staff must implement when conducting work to prevent fires based on Fire Potential Index. PG&E keeps basic fire suppression equipment in all company vehicles and at many Project facilities. Fire suppression equipment includes fire extinguishers and hand tools such as shovels, McLeod tool (rakehoe), and other tools. Motorized equipment and vehicles have spark arrestors, preventing unintended fire ignition due to sparks.

Potential impacts to fire risks from construction are reduced to a negligible level with implementation of the Construction Fire Plan, in addition to PG&E's standard fire prevention and mitigation protocols.

Potential Damage to Roads as a Result of Construction Activities

The use of heavy construction vehicles, including haulers and large trucks, may accelerate the wear of roadways, particularly on unpaved Project roadways such as Scott Dam Road and Upper Scott Dam Access Road. Wear could include potholes, cracks, and uneven surfaces and could lead to repairs being needed sooner than under the No-Action Alternative. Prior to construction, the construction contractor would prepare a Construction Transportation Management Plan, which would include requirements to harden heavily used parking area surfaces. A Post-construction Road Restoration Plan would be implemented with measures to assess road conditions and actions to remediate damage. Prior to construction, PG&E will obtain transportation permits from the California Department of Transportation (Caltrans) (e.g., oversized/overweight or variance permit) and County permits as applicable, and will comply with all measures outlined in the permits. If travel routes include USFS roads, then additional permits may be obtained and additional conditions imposed (e.g., specifying when roads may be used or what repairs might be necessary).

While the use of heavy construction vehicles could potentially increase the wear of roads and result in road damage, construction measures include requirements to address and remediate such damage. Therefore, road damage resulting from construction vehicle use is considered negligible.

Phase 2: Post-facility Removal Effects

The following initial temporary conditions and preliminary restoration (Phase 2a) and resulting physical conditions and restoration (Phase 2b) potential effects to land use resulting from physical changes that may occur following removal of the dams and recreation facilities/ancillary facilities (Phase 2) compared to the No-Action Alternative (existing condition) were evaluated:

- Potential flooding from accumulated sediment;
- Potential damage to bridges and road crossings due to flooding;
- Loss of the Lake Pillsbury water source for fire suppression;
- Changes to land use associated with removal of FERC jurisdictional boundaries;
- Removal of Project roads and trails from FERC jurisdiction;
- Potential effects on Wild and Scenic River (W&SR) designation; and
- Potential changes in agricultural practices from reduced water flows.

The relevant potential effects are discussed by region below (Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and East Branch Russian River Watershed). Where impacts in one region are similar to those in another, the discussion references the previous section to avoid redundancy.

Scott Dam and Cape Horn Dam Areas

Potential Flooding from Accumulated Sediment and Potential Damage to Bridges and Road Crossings Due to Flooding

Dam removals may lead to substantial hydrological changes with potential effects to both the surrounding environment and infrastructure. As described in Section 3.4.1.2, Water Use and Hydrology, and Section 3.4.1.8, Geomorphology, when a dam is removed, sediment that has accumulated in the reservoir over time is released downstream, which is deposited on the riverbed and surrounding areas. This deposition can reduce the capacity of the river and floodways to transport water during periods of high rainfall, which can potentially cause localized flooding in areas that were previously unaffected. These changes can heighten the risk of flooding at downstream structures, such as bridges and road crossings. Flooding effects may include undermining the structural integrity of infrastructures, such as erosion around bridge supports and road foundations, making them more vulnerable to damage.

Deposition of sand in the Eel River downstream of Scott Dam would decrease conveyance capacity at the existing bridges until the accumulated sediment is transported downstream.

Potential adverse effects may occur to infrastructure located downstream of Scott Dam from sediment deposition. Potential adverse effects may also occur to other infrastructure along the river, such as water intakes or diversions being buried or plugged and becoming inoperable or requiring ongoing management from sediment deposition.

However, plans would be developed to mitigate such potential effects. The Sediment/Channel Monitoring and Response Plan would monitor sediment deposition to assess for problematic levels of flow conveyance reduction and monitor for potential scour at bridges in the event of a large flow from notching Scott Dam, allowing for timely interventions if necessary. The Restoration Plan would address rehabilitating affected ecosystems and restoring natural habitats to promote resilience against flooding. Additionally, the Flood Monitoring Plan would establish protocols for monitoring water levels and flood risks, enabling proactive measures to protect infrastructure and surrounding areas. Together, these plans would help manage and mitigate potential effects of dam removal effectively (also see Section 3.4.1.8).

Potential impacts associated with flooding risks, and potential damages to bridges and road crossings due to flooding, are considered minor with adherence to conditions contained within the Sediment/Channel Monitoring and Response Plan and Flood Monitoring Plan.

Loss of the Lake Pillsbury Water Source for Fire Suppression

Lake Pillsbury has provided a water resource to firefighting operations for state and federal firefighting agencies in recent years. The loss of Lake Pillsbury could cause a loss of this source of water for fire suppression, particularly for local fire suppression needs, and would increase use of other sources of water, such as Clear Lake, which is about 49 miles from Lake Pillsbury.

In general, fire prevention and fuels management in the Project vicinity are the responsibility of USFS, the California Department of Forestry and Fire Protection (CAL FIRE), and Lake and Mendocino counties. CAL FIRE has stated that it uses all available water sources when responding to incidents in the greater Lake County region, including Lake Pillsbury and Clear Lake (Tyler 2023). Clear Lake is a much larger body of water and offers a more central location for use on incidents throughout the region (Tyler 2023). CAL FIRE recently expanded its aerial firefighting capabilities using the S-70i FIREHAWK helicopter, which allows for larger amounts of water to be drawn from Clear Lake and delivered more quickly to incidents within the region (Tyler 2023).

Therefore, while Lake Pillsbury water used for fire suppression would be lost, it would be substituted with other sources of water such as Clear Lake or Lake Mendocino, located about 20 miles from Lake Pillsbury. Large fires located closer to Lake Pillsbury may involve longer response times due to sourcing water from other locations (such as the river or other, more distant water sources such as Lake Winawa [a much smaller lake] and Lake Sonoma [about 75 miles from Lake Pillsbury]).

Additionally, Lake Pillsbury currently provides a firebreak. Transitioning from a lacustrine to riverine environment could reduce the effectiveness of the firebreak, as lakes and reservoirs act as natural barriers against fires while rivers may not offer the same protection. Therefore, the loss of the reservoir could weaken the firebreak if surrounding upland vegetation regrows and becomes more fire-prone. Riparian and meadow habitats along the restored Eel River in the historic reservoir bed would also continue to function as effective fuel breaks.

The Proposed Action may have minimal effects to fire suppression on larger fires, as other nearby sources of water are available and are currently being used (e.g., Clear Lake and Lake Mendocino). However, the Proposed Action may result in unavoidable adverse impacts to local fire suppression to properties near Lake Pillsbury due to the loss of Lake Pillsbury as a water source. Longer fire response times may occur when sourcing water from other locations (such as the Eel River or other, more distant water sources).

Changes to Land Use Associated with the Removal of FERC Jurisdictional Boundaries

Land use within the FERC Project boundary is currently primarily hydropower generation and recreation, both of which are managed in accordance with the articles and conditions outlined in the Project license, associated management plans, and several special use authorizations and memoranda of agreement between PG&E and the Mendocino National Forest.

The removal of FERC jurisdictional boundaries means the lands would no longer be under FERC jurisdiction and, as a result, would no longer be subject to the terms and conditions of the FERC license or be used for potential power generation. These areas would be managed by current land use owners which includes PG&E, USFS, and private entities. Potential impacts to changes to land use associated with removal of FERC jurisdictional boundaries are considered negligible.

For PG&E-owned Project lands, all of which are under existing conservation agreements, the removal of FERC jurisdictional boundaries would put those lands fully under the conservation agreement, as their inclusion in the FERC boundary may have entailed some exclusions from the agreements. A conservation easement for 5,660 acres of PG&E-owned land, of which approximately 2,234 acres are within the FERC Project boundary, was recorded on June 28, 2022, to permanently protect beneficial public values on lands owned by PG&E at the Eel River Planning Unit. The conservation easement is held by the Mendocino Land Trust. This means that approximately 2,234 acres of land would be permanently protected for beneficial public values on lands owned by PG&E at the Eel River Planning Unit and managed by the Mendocino Land Trust.

The removal of FERC jurisdictional boundaries means the lands would no longer be under FERC jurisdiction and thus not be subject to the terms and conditions of the FERC license. Potential impacts to changes to land use associated with the removal of FERC jurisdictional boundaries are considered negligible.

Removal of Project Roads and Trails from FERC Jurisdiction

PG&E has been responsible for the operation and maintenance of Project roads and trails. Project roads and trails are roads that are used almost exclusively by PG&E for routine operation and maintenance of the Project. All the Project roads will be removed from the FERC license, with the exception of roads associated with Trout Creek Campground. Most of the roads will be removed with restoration (Table 2-8), and Scott Dam Road and Upper Scott Dam Access Road would be left in place, and Gage E2 Access Road would be transferred to the ERPA and maintained by ERPA as part of that effort.

Project facility access roads are roads used to access Project facilities and Project recreational facilities. Since the facilities, except for Trout Creek Campground and its associated roads which will be transferred to a third party, would be removed, these roads would no longer be used, resulting in negligible impacts.

As the FERC jurisdictional boundaries are removed, there would no longer be a requirement for PG&E to maintain roads and PG&E may decide to close other roads permanently. Closed roads would be restored as described in the Restoration Plan.

For the roads that would be kept in place, there would be no impact. For the roads that would be closed and restored, transportation use in these areas would cease as the land is returned to its natural state. Closure of Project roads that provide access to Project facilities were primarily used by PG&E, and therefore, there would be negligible impact to the public and would result in an environmental benefit. Effects of closure of Project roads to access Project recreation facilities to the public would also be negligible as these facilities would also be closed. Therefore, the overall impact of road closures and restorations is considered negligible.

Two trails in the Scott Dam and Cape Horn Dam areas, the Leakage Weir Access Trail and the Gage E11 Access Trail, respectively, are used by PG&E to access Project facilities. Both trails will be removed from the FERC license. The Leakage Weir Access Trail will be left in place (see Table 2-8) and the Gage E11 Access Trail will be transferred to the ERPA (see Table 2-10). Since these trails would be left in place, potential impacts to these trails from the Project are considered negligible.

Eel River Watershed

Potential Flooding from Accumulated Sediment and Potential Damage to Bridges and Road Crossings Due to Flooding

Potential flooding effects from accumulated sediment, and potential damage to bridges and road crossings due to flooding in the Eel River Watershed area, are similar to those for the Cape Horn Dam Area but would be further diminished with increasing distance downstream from Cape Horn Dam.

Potential Effects on Wild and Scenic River Designation

The Eel River from 100 yards downstream of Cape Horn Dam to its mouth is designated as a W&SR under both the National and California W&SR systems. The W&SR Act specifically prohibits the construction of dams or diversions on W&SRs, mainly to preserve the free-flowing nature of the river. Therefore, the dam removals will support the free-flowing nature of the river and impacts are considered beneficial.

Russian River Watershed

Potential Changes in Agricultural Practices from Reduced Water Flows

Post-construction, there would be reduced water flows into the Russian River from the loss of diversion through Cape Horn Dam which may affect agricultural practices in the Russian River Watershed. Agricultural practices may change as a result, including developing or sourcing alternative water supplies (potentially requiring new infrastructure or additional costs), planting alternative crops, and changes in planting, irrigating, and harvesting techniques. Depending on the magnitude of water reductions, some water-intensive agricultural operations may cease altogether. However, if inter-basin transfers of water are continued (see Section 3.4.2) and/or if alternative water strategies can be achieved, this effect would be negligible.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. Two alternate sequencing options to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

If the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam, mechanical removal of sediment behind Cape Horn Dam would be required and may extend the construction period. However, the extent of impacts related to land use would not change as a result of the extended construction period. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice. In a subsequent year, when Cape Horn Dam is removed, another flush of suspended sediment and highly turbid waters would be released into the Eel River. However, this would be a much smaller volume of suspended sediments than would have been mobilized from behind Scott Dam, and potential impacts related to land use associated with the discharge of sediment would be resolved more quickly than if both dams were removed in the same year, as evaluated under the Proposed Action. Overall, effects to land use in the Scott Dam and Cape Horn Dam areas would be expected to the same as under the Proposed Action.

Under the Cape Horn Dam removal prior to Scott Dam option, sediment would be released twice—once following removal of Cape Horn Dam and once following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (refer to Non-Project Use of Project Lands Application). This sequencing option could lessen the potential adverse effect of sedimentation causing conveyance capacity and flood risk concerns at the bridges upstream of Cape Horn Dam. This sequencing option would also result in high suspended sediment concentrations and turbidity levels over two different periods rather than being concentrated into a relatively shorter time period if both dams were removed in the same season. Furthermore, this sequencing option would extend the ability of fire suppression efforts to use Lake Pillsbury water for one more year than under the Proposed Action. Therefore, the severity of effects related to land use may be slightly reduced under the sequencing option wherein Cape Horn Dam is removed prior to Scott Dam.

Overall, both sequencing options would result in potential adverse effects to infrastructure located downstream of Scott Dam from sediment deposition, similar to the Proposed Action, but the effects would be split between two years rather than occurring in a single year as would occur under the Proposed Action. Potential adverse effects of sedimentation causing conveyance capacity and flood risk concerns at the bridges upstream of Cape Horn Dam may be reduced under the second sequencing option. Also, adverse impacts to fire suppression efforts from the loss of Lake Pillsbury, which could lengthen response times, would be delayed by one year under the second option compared with the Proposed Action.

Construction and Environmental Measures

To avoid or reduce effects to land use during construction, PG&E would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Forest Service Use Permit conditions (for temporary use; for lands not within the FERC Project boundary)
- Restoration Plan
- BMPs
  - Limit work areas to minimize disturbance
  - Limit location of staging and access to developed routes and previously disturbed areas to the extent practical
- Construction Recreation Plan
- Construction Fire Plan
- Construction Transportation Management Plan
- Post-construction Road Restoration Plan
- County and/or Caltrans transportation permit measures
- USFS road permit conditions (if needed)

To reduce potential effects to land use post-facility removal, PG&E would implement the following environmental measures. A complete list of environmental measures is included in Section 2.2.3.

- Water and sediment measures (see Sections 3.4.1.2 and 3.4.1.8)
- Restoration Plan
- Sediment/Channel Monitoring and Response Plan
- Flood Monitoring Plan

Unavoidable Adverse Effects

The Proposed Action may result in unavoidable adverse effects to local fire suppression to properties near Lake Pillsbury due to the replacement of Lake Pillsbury with the Eel River or other sources as a water source, resulting in potentially longer fire response times.

References

Tyler, J. 2023. Comments of Joe Tyler, CAL FIRE Chief regarding Pacific Gas and Electric Company's license surrender application for Scott Dam, part of the Potter Valley Project, P-77. Submitted to Willie L. Phillips, Federal Energy Regulatory Commission, October 5, 2023. FERC e-library Accession No. 20231006-4000. Available at: https://elibrary.ferc.gov/eLibrary/filelist?accession_num=20231006-4000.

TABLE OF CONTENTS

List of Acronyms

MNF	Mendocino National Forest
OHV	off-highway vehicle
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
USFS	U.S. Forest Service

This Page Intentionally Left Blank

3.4.1.10 Recreation Resources

This section describes the potential effects to recreation resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the changes in recreation that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider construction measures and post-facility measures included to avoid or mitigate impacts associated with the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential effect to recreation resulting from Project facility modifications was evaluated:

- Reduction in recreation opportunities and experience during construction

The relevant potential effects are discussed by region below (Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and East Branch Russian River Watershed). Where impacts in one region are similar to those in another, the discussion references the previous section to avoid redundancy. The potential effects to recreation of the removal of the recreation facilities are analyzed in Phase 2.

Potential effects from construction activities, such as impacts to traffic, noise, water quality, and land use, are discussed in other sections (see Section 3.4.1.18, Traffic; Section 3.4.1.17, Noise and Vibration; Section 3.4.1.3, Water Quality; and Section 3.4.1.9, Land Use).

Scott Dam Area

All Project recreation facilities (i.e., campgrounds and day-use areas), ancillary facilities, and associated access roads in the Scott Dam Area would be removed, and the sites would be restored, as described in the Proposed Action. Table 2-8 provides a summary of decommissioning of Project facilities and features and Project recreation facilities in the Scott Dam Area; the locations of these facilities are shown on Maps 2.2-2a and 2.2-2b. Construction activities associated with the removal of the recreation facilities and ancillary features are anticipated to last for approximately 2 years in duration and would occur at the same time as the dam removal construction activities, depending on site conditions. In addition, there are several recreation facilities in the Scott Dam Area that are owned by entities other than PG&E including a resort and residences with long-term U.S. Forest Service (USFS) leases with boat docks operated under agreements with PG&E (see Table 3.3.9-2). During construction at Scott Dam, Lake Pillsbury would be drawn down to approximately 10,000 acre-feet by October of the initial low-flow season, which would result in the reduction of fishing and other reservoir-based recreation activities.

A site-specific engineering design would be developed for PG&E's recreation facilities to be decommissioned that would include the following:

- Detailed description of facility decommissioning
- Agency consultation process to determine underground utilities that would be left in place
- Construction schedule
- Public notification
- Public access and signage requirements during construction
- Agency review and modification, if appropriate, of environmental measures considering site-specific engineering design

The construction area for Project recreation facility removal includes the facility footprint plus an established buffer (see Section 2.2) to encompass the construction work area, staging areas, and stockpile areas.

PG&E will restrict public access in construction areas and close Project recreation facilities, roads, and trails to public access during construction. Day use, camping, hiking, fishing, swimming, off-highway vehicle (OHV) use, and boating in the Scott Dam Area, including at non-Project recreation facilities, would be impacted. Other locations offering similar lake-based recreational opportunities are a 45-minute to 2-hour drive from Lake Pillsbury and include Clear Lake, Lake Sonoma, and Lake Mendocino, among others.

A Construction Recreation Plan would be developed and implemented that will include public notification measures, such as announcements and postings of the Project construction schedule and closure areas, and educational signage that informs recreationists about Project activities. PG&E will also develop a Public Safety Plan that will include measures to address and reduce potential safety risks to the public during construction. However, unavoidable adverse effects to recreation opportunities would still occur from the drawdown of Lake Pillsbury and recreational use being restricted during construction.

Cape Horn Dam Area

As discussed in Section 3.3.9, recreation opportunities in the Cape Horn Dam Area are limited due to private land ownership and access constraints. The only developed recreation facility in the vicinity of Cape Horn Dam is Trout Creek Campground, which is located on the north side of the Eel River, approximately 3.7 river miles upstream of Cape Horn Dam. Trout Creek Campground will not be removed and would instead be transferred to a third party. This facility consists of 13 family campsites, 1 double-occupancy site, and 1 walk-in group site that can accommodate up to 18 people. Trout Creek Campground primarily supports stream-based recreation activities such as swimming, wading, and canoeing. Fishing is not allowed on the Eel River between Cape Horn Dam and Scott Dam (see Section 3.3.9).

Trout Creek Campground is located approximately 3.7 miles upstream of Cape Horn Dam. No construction activity will occur in the vicinity of Trout Creek Campground. In addition, the Eel River in the vicinity of Trout Creek Campground will not be dewatered to facilitate construction. The same range of flows that recreation visitors currently experience will be present during construction at Cape Horn Dam. Furthermore, construction activities at Cape Horn Dam will not impede access to Trout Creek Campground. Recreation visitors will continue to be able to use Trout Creek Campground as they do now. Recreationists in the Cape Horn Dam area would be informed through measures in the Construction Recreation Plan. Therefore, construction at Cape Horn Dam will have no effect on recreation use or opportunities on the Eel River compared to existing conditions.

Eel River Watershed

Construction activities at Scott Dam would temporarily affect flows in the Eel River downstream of the dam. Drawdown of the reservoir would result in a release from Scott Dam of up to 400 cubic feet per second into the Eel River for a period of two to four months (see Table 3.4.1.2-1). The potential increase in flow above existing conditions depends on the water year type and associated minimum instream flow requirements (see Section 3.4.1.2, Water Use and Hydrology). Following the drawdown and dam lowering/spillway notching, natural flows would pass over the dam into the Eel River (there would be no storage). During times of low natural flow, this would result in less flow below Scott Dam than under existing conditions, and during times of high natural flow, this would result in more flow below Scott Dam than under existing conditions due to the lack of the ability of Scott Dam to impound water. Potential effects to water quality and aquatics during Phase 1 are discussed in Section 3.4.1.3, Water Quality, and Section 3.4.1.4, Fish and Aquatic Resources, respectively. The characteristics of aquatic riverine habitat downstream of Scott Dam during Phase 1 are expected to remain largely unchanged. There would be an unavoidable adverse short-term effect to suspended sediment and turbidity in the Eel River downstream of Scott Dam as a result of reservoir dewatering, dam lowering, and dredging during Scott Dam deconstruction. PG&E will implement several water quality and erosion control measures during Phase 1 (see Section 3.4.1.3, Water Quality). There may be short-term, temporary effects to recreational fishing opportunities due to access in the Eel River Watershed due to changes in water levels. Recreation watercraft use may also be affected by a change in flows and water quality during the construction period. PG&E will develop and implement a Construction Recreation Plan that will include measures for public notifications of changes in flow conditions during the Phase 1 construction activities. PG&E will develop and implement a Public Safety Plan that will identify potential public safety risks and measures that will be implemented during construction to minimize risks. Other recreation is limited due to the steep terrain and land ownership. With the implementation of these measures during Phase 1 construction activities, potential effects to recreation resources would be considered negligible.

East Branch Russian River Watershed

While there are no construction activities occurring in the East Branch Russian River Watershed, and thus no direct construction impacts, flows and water quality may change during Phase 1 activities (see Section 3.4.1.2, Water Use and Hydrology, and Section 3.4.1.3, Water Quality), which would have the potential to affect fish and, therefore, recreational fishing. Recreation opportunities are limited owing to the presence of private property, steeply incised banks, and dense vegetation, all of which impede access to the river. Some day-use recreation may occur at bridge crossings as well as angling, swimming and wading in areas with access to the water. Recreation watercraft use also occurs in the East Brach Russian River, which may also be affected by a change in flows and water quality through the river during construction.

To address and reduce potential effects to aquatic resources in the East Branch Russian River during Phase 1, PG&E would develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. These flows during Phase 1 construction activities may result in water diverted to the East Branch Russian River being warmer than average, similar to a warm, dry year but likely within the range of historical temperatures and, therefore, would not affect aquatic resources. With implementation of the East Branch Russian River Diversion Plan, water would continue to be diverted to the East Branch Russian River during construction, and therefore, potential effects to recreation resources would be considered negligible.

Phase 2: Post-facility Removal Effects

The following initial temporary conditions and preliminary restoration (Phase 2a) and resulting physical conditions and restoration (Phase 2b) potential effects to recreation resulting from physical changes that may occur following removals of the dams and recreation facilities/ancillary facilities (Phase 2) compared to the No-Action Alternative (existing condition) were evaluated:

- Transition of lake-based recreation to riverine recreation opportunities in the Scott Dam Area and Cape Horn Dam Area;
- Potential increase in uncontrolled OHV use in Lake Pillsbury;
- Permanent loss of Project recreation facilities in the Scott Dam Area;
- Potential of reduced recreation opportunities in the Eel River due to increased turbidity after dam removal;

- Potential changes in stream-based recreation use along the Eel River related natural unimpaired flows; and
- Change in angling, swimming, and recreation watercraft use opportunities in the East Branch Russian River.

The relevant potential effects are discussed by region below (Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and East Branch Russian River Watershed). Where impacts in one region are similar to those in another, the discussion references the previous section to avoid redundancy.

Scott Dam Area

Transition of Lake-based Recreation to Riverine Recreation Opportunities

The removal of Scott Dam, Project recreation facilities/ancillary facilities, and loss of Lake Pillsbury under the Proposed Action would eliminate existing opportunities for reservoir-based recreation activities. Some recreation facilities in the Scott Dam Area are owned by entities other than PG&E, including Lake Pilsbury Resort, and their future operations plans are unknown at this time. Over time, recreation opportunities would likely transition to river-based fishing, boating, swimming, day use, picnicking, and walking/hiking (OHV use is discussed in the following section below).

Under the Proposed Action, PG&E will implement the Restoration Plan. The plan includes goals to re-establish the historical channels and floodplains of the Eel River, Rice Fork Creek, and other tributaries in the historic reservoir; revegetate the former reservoir and uplands; re-establish fluvio-geomorphic and vegetation processes along the Eel River in the former reservoir; allow for fish passage in the Eel River upstream of the former Scott Dam location; and promote diverse aquatic habitat for fish and aquatic amphibians, reptiles, and invertebrates by allowing access to historical anadromous fish habitat upstream of the former dam and re-establishing fluvio-geomorphic processes. During restoration of the former reservoir, recreation access may be restricted while construction activities associated with the restoration are ongoing and to promote successful revegetation. Through the implementation of the Restoration Plan, restoration of the former reservoir bed of Lake Pillsbury would convert a large area of formerly lacustrine habitats to a mosaic of upland, wetland, and riparian habitats found along the restored channel of the Eel River and tributary streams and provide improved access for anadromous fish to tributaries upstream of the former Scott Dam. Implementation of the plan would help ensure that the river is restored, which would result in conditions favorable for river-based recreation in the future. However, unavoidable adverse effects may occur from a loss in reservoir-based recreational use from the removal of Scott Dam, recreation facilities, and other ancillary facilities and loss of Lake Pillsbury.

Potential Increase in Uncontrolled OHV Use in Lake Pillsbury

The Lake Pillsbury area has historically served as a base for OHV use and provided opportunities for a variety of vehicle types, including motorcycles, all-terrain vehicles, dune buggies, side-by-sides, and 4x4s. The USFS, in cooperation with the State of California Off-Highway Vehicle Fund, has developed roads, trails, and facilities for OHV use at PG&E's Oak Flat Campground at Lake Pillsbury. Travel on National Forest System roads in the Lake Pillsbury area is managed and controlled by the Mendocino National Forest (MNF) pursuant to regulations contained in 36 Code of Federal Regulations 212.51. According to MNF, conflicts between OHV use and other recreation users are common throughout the year and frequently require law enforcement efforts (USFS-MNF 1995). The MNF Land and Resource Management Plan contains management direction aimed at reducing conflicts between OHV users and other recreationists (e.g., trail designations and administrative controls).

The Proposed Action, with the removal of Scott Dam and loss of Lake Pillsbury, could potentially lead to an increase in uncontrolled OHV use in the newly exposed land areas after the dam is removed, including the historic reservoir. During restoration, PG&E would implement the Restoration Plan. This plan will include measures to restrict access during active restoration activities as well as while the area is revegetating. With implementation of access restrictions in the Restoration Plan potential of increased OHV use may be reduced to negligible.

Permanent Loss of Project Recreation Facilities

Former recreation facility sites would be restored to a natural environment with implementation of the Restoration Plan. This plan would focus on rehabilitating affected ecosystems and restoring natural habitats. The loss of recreational facilities including the campgrounds and day-use areas would result in loss in camping and day use of the area.

There would be unavoidable adverse effects to recreation, including camping and day use, resulting from the permanent loss of Project recreation facilities in this area.

Cape Horn Dam Area

As discussed above, there are limited recreation opportunities in the Cape Horn Dam Area, and the one facility, Trout Creek Campground, will be transferred to a third party and remain open.

Transition of Lake-based Recreation to Riverine Recreation Opportunities.

As discussed above, recreation opportunities in the Cape Horn Dam Area are limited due to private land ownership and access constraints. However, similar to the Scott Dam Area, with the removal of Cape Horn Dam and Van Arsdale Reservoir, the Eel River would return to a free-flowing river in the Cape Horn Dam Area. This would result in a transition from lake-based recreation to riverine-based recreation activities. Potential effects would be similar to those discussed above for Scott Dam, with the exception that the Cape Horn Dam Area has substantially less reservoir-based recreational opportunities than the Scott Dam Area.

Eel River Watershed

Potential Effects to Stream-based Recreation Due to Increased Turbidity after Dam Removal (Phase 2a)

Phase 2a includes the initial temporary physical conditions that would occur immediately following dam removal, including the initial release of stored water and sediment following the removal of the adit plug at Scott Dam and the complete removal of Scott Dam and Cape Horn Dam. Poor water quality and sediment deposition would occur after this initial sediment release, which would continue until the system stabilizes and water quality and sediment transport return to natural conditions.

Removal of Scott Dam and Cape Horn Dam would return the flow of the Eel River to a natural state. Section 3.4.1.2, Water Use and Hydrology, provides details about these changes. Following the removal of Scott Dam and Cape Horn Dam, natural (unimpaired) hydrology would pass through the Eel River downstream below Cape Horn Dam. Stored water would not be present to maintain the current Reasonable and Prudent Alternative minimum instream flows in the Eel River when the natural hydrology is not sufficient to meet those requirements. Flow in the Eel River following removal of Scott Dam compared to flow in the existing condition is discussed in Section 3.3.1 and shown on Figure 3.3.1-19. A summary of the average monthly flow is shown on Figure 3.4.1.2-2.

The release and transport of accumulated sediment would result in short-term and temporary adverse effects on aquatic species inhabiting the mainstem of the Eel River downstream of Scott Dam during and immediately following the release of sediments from Lake Pillsbury. Very high suspended sediment concentrations would occur downstream of the dam removal sites for 1 to 8 days depending on the flow rates at the time of removal. High suspended sediment loads may kill or adversely affect the physiology and behavior of fish and other aquatic biota (see Section 3.4.1.4, Fish and Aquatic Resources, for more detailed information). This, in turn, would adversely affect recreational fishing in the short term. With the removal of the dams and return to natural hydrology and physical river processes, in comparison to the No-Action Alternative, the long-term effects on aquatic biota and fishing opportunities are expected to be permanent, significant, and beneficial (discussed further below).

The initially highly turbid water after dam removal may also affect some recreation watercraft users in the Eel River below Scott Dam due to reduced aesthetics of the river. PG&E will develop and implement a Construction Recreation Plan that will include measures for public notifications of changes in flow and water quality conditions following the detonation of the adit plug. Other recreation is limited due to the steep terrain and land ownership.

Removing Scott Dam and Cape Horn Dam would have a short-term unavoidable adverse effect on turbidity and suspended sediment in the Eel River that would result in the mortality of aquatic biota, which would, in turn, adversely affect fishing in the Eel River. The timing of dam removal will be designed to minimize effects to sensitive species in the Eel River. The Eel River would return to unimpaired/natural flow and water temperature conditions (Phase 2b) that existed prior to the construction of Scott and Cape Horn dams, which would be a benefit to recreation resources.

Potential Changes in Stream-based Recreation Use along the Eel River Related to Natural, Unimpaired Flows (Phase 2b)

The removal of the dams would allow increased fish passage and access to riverine habitat (including spawning and rearing areas) above the dams that is expected to increase the numbers of naturally produced salmon, steelhead, and Pacific lamprey in the Eel River (see Section 3.4.1.4). This is expected to improve angling opportunities in the Eel River, resulting in beneficial effects to recreation. Similarly, other river-based recreation opportunities, such as recreation watercraft use, would be expected to improve under natural flow conditions.

East Branch Russian River Watershed

Change in Angling, Swimming, and Recreation Watercraft Opportunities in the East Branch Russian River

Altered hydrology in the Eel River would change flows in the East Branch Russian River and would have an adverse effect on existing aquatic habitat and some river-based recreation activities. Under the Proposed Action, there would be no diversions from the Eel River to the East Branch Russian River and East Branch Russian River flows would return to natural (unimpaired) conditions with potentially considerably lower flows during dry summer months (as low as 1 cubic foot per second) (see Section 3.4.1.2, Water Use and Hydrology, and Section 3.4.1.4, Fish and Aquatic Resources). A reduction in summer flows during dry periods would likely adversely affect fishing, recreation watercraft, and swimming opportunities.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

If the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam, removal of sediment behind Cape Horn Dam would be required and may extend the construction period. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice. In the reach of the Eel River between Scott Dam and Cape Horn Dam, the effects would be the same as under the Proposed Action. In a subsequent year, when Cape Horn Dam is removed, another flush of high turbidity/suspended sediment would be released into the Eel River. This would be a much smaller release of suspended sediments than would have been mobilized from behind Scott Dam. Construction-related disturbance may need to occur during two years rather than just a single year as would occur under the Proposed Action. As there is limited recreation at Cape Horn Dam, effects to recreation resources in the Cape Horn Dam Area would be expected to be the same as under the Proposed Action. However, the alternate dam removal sequencing options would increase the duration of time that conditions may remain turbid in the river, which could affect recreation opportunities downstream of Cape Horn Dam.

Under the Cape Horn Dam removal prior to Scott Dam option, sediment would be released twice—once following removal of Cape Horn Dam and following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (refer to Non-Project Use of Project Lands Application). Implementation of this option would result in an extended period of elevated turbidity in the Eel River as a result of the staggered timing of the Scott Dam and Cape Horn Dam removals.

Overall, both sequencing options would have unavoidable adverse effects on water quality and aquatic resources that could affect recreation opportunities in the river, similar to the Proposed Action, but the effects would be split between two years rather than occurring in a single year as would occur under the Proposed Action.

Construction and Environmental Measures

To avoid or reduce effects to recreation resources during construction, PG&E would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Construction Recreation Plan with public notification measures
- Public Safety Plan to reduce potential safety risks to the public during construction
- East Branch Russian River Diversion Plan to provide diversions to the East Branch Russian River during construction
- Water Quality and Erosion Control measures (see Section 3.4.1.3, Water Quality)
- Fisheries and aquatic resource measures (see Section 3.4.1.4, Fish and Aquatic Resources)
- Restoration Plan for environmental restoration including measures to restrict access during restoration and revegetation

To reduce potential effects to land use during the initial conditions and preliminary restoration (Phase 2a) and resulting conditions and restoration (Phase 2b), PG&E would implement the following environmental measures. A complete list of environmental measures is included in Section 2.2.3.

- Fisheries and aquatic resource measures (see Section 3.4.1.4, Fish and Aquatic Resources)
- Restoration Plan for environmental restoration including measures to restrict access during restoration and revegetation

Unavoidable Adverse Effects

Unavoidable adverse effects to recreation resources include the following:

- Short-term loss of recreation opportunities during construction at Lake Pillsbury from the drawdown of Lake Pillsbury and restricted recreation use;
- Loss of recreation opportunities at Lake Pillsbury with the removal of PG&E recreation facilities and ancillary features (permanent loss);
- Loss of reservoir-based recreation at Lake Pillsbury with the transition of a lacustrine to riverine environment;
  - Implementation of the Restoration Plan would ensure that the Eel River is restored in the former reservoir bed, which would result in conditions favorable for river-based recreation over the long-term
- Potential short-term, temporary effects to fishing opportunities in the Eel River from high suspended sediment load and aquatic biota mortality; and
- Potential reduction in fishing, recreation watercraft, and swimming opportunities in the East Branch Russian River during low summer flows because water would no longer be diverted to the East Branch Russian River under the Proposed Action.

References

USFS-MNF (U.S. Forest Service, Pacific Southwest Region, Mendocino National Forest). 1995. Mendocino National Forest Land and Resource Management Plan. February. Available at: http://www.fs.usda.gov/detailfull/mendocino/landmanagement/.

TABLE OF CONTENTS

List of Acronyms

ft.	feet
ORV	Outstandingly Remarkable Value
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
VQO	Visual Quality Objective
W&SR	Wild and Scenic River

This Page Intentionally Left Blank

3.4.1.11 Aesthetic Resources

This section describes the potential effects to aesthetic resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Refer to Section 3.4.1 for a description of each phase.

The effects are determined by analyzing the changes in the aesthetic environment that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Cape Horn Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential effects to aesthetic resources resulting from Project facility modifications were evaluated:

- Potential effects to aesthetic resources due to the presence of construction work and staging areas at and around the construction work and staging areas, including the dewatered reservoirs.
- Potential effects on Eel River Wild and Scenic River (W&SR) status that could result during and from construction.

- Potential effects on scenic corridors that could result during and from construction.
- Potential effects to aesthetics resources due to the removal of Scott Dam and Cape Horn Dam.

Potential Effects due to Construction Activities

Under Phase 1 of the Proposed Action, several temporary access roads and staging areas would be constructed, Lake Pillsbury would be dewatered, and Scott Dam would be removed. In addition, all of the Project recreation facilities surrounding Lake Pillsbury and all associated features (e.g. facility access roads, water supply wells, water distribution lines, etc.) would be removed. In the Cape Horn Dam Area, cofferdams would be constructed upstream and downstream of the work area and the work area would be dewatered, and the dam and select associated facilities and features would be demolished and removed. Equipment staging and work areas at both dams would introduce heavy equipment, fencing, and other materials that would contrast with the natural environment at the construction site.

At Scott Dam, the construction site may be partially visible from some public viewpoints along the shoreline and potentially through the vegetation from the residential area south of Scott Dam. At Cape Horn Dam, obstructed views of the construction site may occur to motorists traveling along Ridgeway Highway and Van Arsdale Road. Equipment and materials used for construction include metal, concrete, and high-visibility colors, which may stand out against the colors, textures, lines, and forms of the natural environment. This contrast would draw viewers' attention to the construction elements and temporarily reduce the scenic quality of the area. Additional effects to the visual environment may result from fugitive dust emissions caused by construction activities. This temporary visual impact would be limited to the duration of the two seasons of construction periods associated with the removal of Scott Dam and one season at Cape Horn Dam. Furthermore, PG&E would implement dust control measures during construction as part of General Construction Measures, including emission reduction measures and fugitive dust reduction measures (refer to Section 2.2.3).

The Visual Quality Objective (VQO) classifications for the region surrounding Lake Pillsbury, as established in the Mendocino National Forest Land and Resource Management Plan, are presented on Map 3.3.10-2 in Section 3.3.10, Aesthetic Resources. In general, the shoreline area surrounding Lake Pillsbury is designated as Retention VQO. Per U.S. Forest Service guidance for the Retention VQO, impacts of management activities in highly visible foreground areas shall be addressed and reduced through special treatments such as leaving residual vegetation and screening. Project construction activities would not affect the existing vegetation in the Scott Dam Area and would not conflict with the objective for the Retention VQO; therefore, potential effects to the VQO classification during construction are considered negligible.

These temporary visual effects would be temporary and limited to the active construction periods associated with each site: two seasons at Scott Dam and one season at Cape Horn Dam. To reduce potential effects during construction, PG&E would implement General Construction Measures, including limiting construction activities to designated work and staging areas and limiting construction work hours. In summary, the visual quality and character of the landscape viewsheds where construction activities would occur would be reduced compared to existing conditions (i.e., No-Action Alternative) during the period of active construction.

Potential Effects on W&SR Designation

The Eel River in the vicinity of Scott Dam is not included in the National or California W&SR systems (National W&SR System 2024); and therefore, any visible changes related to construction would have no effect on the Eel River's W&SR designation in the vicinity of Scott Dam.

The Eel River from 100 yards downstream of Cape Horn Dam to its mouth is designated as a WS&R under both the National and California W&SR systems. The segment of the Eel River from 100 yards downstream of Cape Horn Dam to the confluence of Tomki Creek is classified as a "Recreational" river segment (not Wild or Scenic). Removal of Cape Horn Dam is upstream of the W&SR segment. In addition, since the Eel River in the vicinity of Cape Horn Dam is not classified as Scenic, any visible changes related to the deconstruction of Cape Horn Dam and associated facilities, except for limited components that will be needed for the NERF, would have no effect on the Eel River's W&SR designation.

Potential Effects on Scenic Corridors

There are no state-designated scenic highway segments in the Scott Dam or Cape Horn Dam areas (Caltrans 2024), and neither the Lake County General Plan nor Mendocino County General Plan identify any specific scenic corridors in Lake County (Lake County 2008) or Mendocino County (Mendocino County 2020). Therefore, construction activities would not result in impacts to aesthetic resources state-designated scenic highway or county-designated scenic corridor.

Potential Effects of the Removal of Scott Dam and Cape Horn Dam

Under the Proposed Action, Scott Dam and Cape Horn Dam would be removed as well as the ancillary facilities associated with the dams. As a result, the visual elements associated with the dams that currently disrupt the integrity of the landscape such as contrasting or intrusive lines, shapes, textures, and colors would be minimized or eliminated. Therefore, while the Proposed Action would have a temporary adverse effect on visual resources during construction activities; the visual character of the dam areas would improve after removal of the dams.

Phase 2: Post-facility Removal Effects

Phase 2 includes an initial temporary condition and preliminary restoration (Phase 2a) and resulting physical conditions and restoration (Phase 2b).

Phase 2a includes analysis of the initial temporary physical conditions that would occur immediately following dam and ancillary/recreation facility removal including:

- Loss of the facility or feature (e.g., loss of reservoir, ancillary facility, or recreation facility)

- Initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam
  - Pulse hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam until the reservoir is drained
  - Sediment load/deposition and turbidity in the Eel River downstream of Scott Dam and Cape Horn Dam
- Continued degraded water quality and sediment deposition after the initial sediment release until the system stabilizes and water quality and sediment transport returns to natural conditions
- Ground disturbance, use of heavy equipment, transport of materials to and from the Scott Dam and Cape Horn Dam area restoration areas to allow for restoration of the former dam sites and ancillary/recreation facility sites

Phase 2b includes analysis of the resulting conditions following dam ancillary/recreation facility removal including:

- Unimpaired hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam
- Restored sediment transport and water quality in the Eel River downstream of Scott Dam and Cape Horn Dam
- Natural hydrology in the East Branch Russian River
- Restored former reservoir beds and ancillary/recreation facility sites following facility removal

The following potential post-facility removal effects to aesthetic resources resulting from physical changes that occur following dam and recreation facility/ancillary facility removal were evaluated:

- Phase 2a
  - Potential effects to aesthetic resources due to the dewatering of the reservoir, initial denuded former reservoir bed, and initial revegetation in the Scott Dam and Cape Horn Dam areas.
  - Potential effects to aesthetic resources due to the initial release of sediment following removal of the adit plug at Scott Dam and removal of the dams in the Eel River below Scott Dam and Cape Horn Dam.
  - Potential effects on Eel River W&SR status that could result from the sediment release and resultant water quality in the Eel River below Scott Dam and Cape Horn Dam and in the East Branch Russian River.
  - Potential effects on scenic corridors that could result from the sediment release and resultant water quality in the Eel River Watershed below Scott Dam and in the East Branch Russian River.

- Phase 2b
  - Potential effects to aesthetic resources due to the conversion of a reservoir with lacustrine habitat to river with riparian habitat and adjacent upland habitat in the Scott Dam and Cape Horn Dam areas.
  - Potential effects to aesthetic resources that could result from the natural hydrologic and geomorphic processes in the Eel River and Russian River from removal of the dams.
  - Potential effects to aesthetic resources due to the restoration of the recreation facilities in the Scott Dam Area.
  - Potential effects on Eel River W&SR status that could result from the natural hydrology and sediment transport in the Eel River and Russian River from removal of the dams.
  - Potential effects on scenic corridors that could result from the natural hydrologic and geomorphic processes in the Eel River and Russian River from removal of the dams.

A discussion of potential post-facility removal effects to aesthetic resources that could occur as a result of facility removal, with incorporation of measures, is provided below by area, as applicable.

Scott Dam Area

<u>Phase 2a</u>

Under existing conditions, when Lake Pillsbury water levels are low, features such as submerged trees and rocky outcrops within the reservoir bed, as well as the "bathtub ring" around the reservoir, are dominant components of the visual experience. Full-pool conditions do not occur because the maximum water surface elevation is maintained at 10 feet (ft.) below full pool to comply with a reservoir restriction. Therefore, the upper 10 ft. of shoreline is exposed. Immediately following the removal of Scott Dam, the bed of Lake Pillsbury would be exposed, which would constitute a substantial change in visual character compared to existing conditions. In addition, ground disturbance, use of heavy equipment, and transport of materials to and from the Scott Dam restoration areas would occur during initial restoration of the former dam site and ancillary/recreation facility sites. The foregoing changes would result in a temporary reduction in the quality of the visual resources in the Scott Dam area. However, the impact would be alleviated following restoration and revegetation, as discussed further below.

<u>Phase 2b</u>

During Phase 2b, the exposed reservoir bed would be revegetated and stabilized, and natural flows of the Eel River would be re-established within the reservoir bed and downstream of the former Scott Dam site. Following restoration activities, the dam site and former reservoir bed would be returned to natural riverine conditions within the landscape, resulting in an overall benefit to visual quality and character as compared to the No-Action Alternative.

Overall, implementation of the Proposed Action would result in a minor beneficial effect to aesthetic resources compared to the No-Action Alternative.

Cape Horn Dam Area

<u>Phase 2a</u>

Under the No-Action Alternative, Van Arsdale Reservoir behind Cape Horn Dam is operated as a run-of-river reservoir and is kept at full pool. Fluctuations in reservoir elevation occur as a result of different flow levels in the Eel River, but not as a function of reservoir storage operations. Following the removal of Cape Horn Dam, the water level of the Van Arsdale Reservoir area would be reduced and additional shoreline would be exposed. The additional shoreline exposure may result in a minor adverse impact to visual resources in the Cape Horn Dam area. However, the impact would be temporary, and would be alleviated following restoration and revegetation, as discussed further below.

<u>Phase 2b</u>

During Phase 2b, the exposed reservoir bed would be revegetated and stabilized, and natural flows of the Eel River would be re-established within the reservoir bed and downstream of the former Cape Horn Dam site. Following restoration activities, the dam site and former reservoir bed would be returned to natural riverine conditions within the landscape, resulting in an overall benefit to visual quality and character as compared to the No-Action Alternative.

Overall, implementation of the Proposed Action would result in a minor beneficial effect to aesthetic resources compared to the No-Action Alternative.

Eel River Watershed

<u>Phase 2a</u>

Potential Effects due to the Initial Release of Sediment

During Phase 2a, a large volume of sediment would be released from behind the dams and into the Eel River. PG&E would schedule the adit blast at Scott Dam and the removal of the Cape Horn cofferdams during a period of high flows, which would minimize the duration of elevated suspended solids to the extent possible. A very large flush of sediments would travel down the Eel River from Scott Dam and cause high turbidity along the entire Eel River to the ocean. A much smaller contribution to suspended sediments will be made by the Cape Horn deconstruction 11.7 miles downstream of Scott Dam. As the highly turbid water travels down the Eel River to the mouth of the Eel River Estuary, some suspended sediments will settle out along the way in the riverbed. These sediments will be remobilized with subsequent high flow events, possibly over the course of several years, until they make their way out of the system. This sediment release would temporarily reduce the visual quality of views of the Eel River, and would be resolved when the sediment has flushed through the Eel River system.

Potential Effects on W&SR Designation

The Eel River from 300 ft. below Cape Horn Dam to the mouth at the Pacific Ocean is designated as a National W&SR. However, the Outstandingly Remarkable Value (ORV) for all of the segments on the mainstem of the Eel River is Fish. Adverse impacts to the visual character of the

Eel River and along the Eel River Watershed may occur during Phase 2a, primarily due the increased turbidity from sediment release. However, the Scenery ORV does not apply to any segment on the mainstem of the Eel River and, as a result, the temporary effects to aesthetic resources would not change the W&SR designation of the Eel River.

Potential Effects on Scenic Corridors

Portions of Highway 101 and Highway 20 that extend through the Eel River Watershed are eligible for designation as scenic highway segments (see Map 3.3.10-1). However, the segments are considered eligible for designation and have not been formally designated. The portions of Highway 101 and Highway 20 that are eligible as scenic highway segments are located west of the Eel River, near the city of Willits. Direct views of the Eel River are not available to motorists travelling along these roadways, and any effects to aesthetic resources that may occur during Phase 2a would have no impact on the scenic highway segments within the Eel River Watershed area.

Phase 2b

Potential Effects from Natural Hydrology and Sediment Transport below the Dams

Under the resulting physical conditions and restoration (Phase 2b), flows along the Eel River would return to natural conditions and would not be regulated through the use of Scott Dam and Cape Horn Dam and associated reservoirs. Increased turbidity in the Eel River downstream of Scott and Cape Horn Dams would be expected during high flow events for up to several years following their removal. Accumulated sediments that are not immediately mobilized during reservoir drawdown would continue to erode over time, releasing higher concentrations of suspended sediments into the Eel River than would be present under existing conditions. Eventually suspended sediment concentrations would return to normal levels following several years of high flow events. As discussed in Section 3.3.2, the Eel River has the highest recorded average annual suspended-sediment yield per square mile of drainage area of any river of its size or larger in the United States, resulting in high turbidity during high flows under existing conditions. In addition, the natural flows in the river would be different from those under the No-Action Alternative (see Section 3.4.1.2). Flows at Scott Dam would be greater in the winter months (November through March), similar through the spring, and lower in the summer months (July through October) under natural conditions compared to the No-Action Alternative. At Cape Horn Dam, flows would be greater during most of the year (November – June) under natural conditions compared to the No-Action Alternative and would be similar in the summer and early fall months. The differences in the water depths at certain times of the year may be noticeable to a casual viewer at some locations. However, while the actual flows would be different, the range of flows under natural conditions would be similar to those that would occur under the No-Action Alternative. Therefore, the resulting condition and restoration would have a negligible effect on aesthetics in the Eel River Watershed area.

Potential Effects on W&SR Designation

The Eel River Watershed area is generally characterized by steep and heavily forested terrain with minimal development. The Eel River from 300 ft. below Cape Horn Dam to the mouth at the Pacific Ocean is designated as a National W&SR (see Map 3.3.10-1). The ORV for all segments on the mainstem of the Eel River is "Fish". The Scenery ORV does not apply to any segment on the mainstem of the Eel River. Therefore, the Proposed Action would not result in impacts related to aesthetic resources on a segment of the Eel River that is designated as a National W&SR.

Potential Effects on Scenic Corridors

Portions of Highway 101 and Highway 20 that extend through the Eel River Watershed are eligible for designation as scenic highway segments (Caltrans 2024). However, the segments are considered eligible for designation and have not been formally designated. The portions of Highway 101 and Highway 20 that are eligible as scenic highway segments are located west of the Eel River, near the city of Willits. Direct views of the Eel River are not available to motorists travelling along these roadways, and any effects to aesthetic resources that may occur during Phase 2b would have no impact on the scenic highway segments within the Eel River Watershed area. In addition, the Proposed Action would not result in direct or long-term impacts to the transportation network.

Russian River Watershed

The following discussion incorporates both Phase 2a and Phase 2b.

<u>Potential Effects to Aesthetic Resources from Natural Hydrology and Sediment Transport below the Dams</u>

Implementation of the Proposed Action would restore flows in the East Branch Russian River to unimpaired natural conditions. Views of the Russian River as seen from the Russian River Watershed area would return to natural conditions, resulting in negligible effects related to aesthetic resources.

<u>Potential Effects on W&SR Designation</u>

The watershed is rural in character and features year-round river flow and hilly or mountainous terrain in the upper reaches. No part of the Russian River, including the East Branch Russian River, is included in the National or California W&SR systems (National W&SR System 2024). Therefore, implementation of the Proposed Action would not result in impacts to any segments of National or California W&SR systems.

<u>Potential Effects on Scenic Corridors</u>

Portions of Highway 101 and Highway 20 that extend through the northern Russian River Watershed are eligible for designation as scenic highway segments (Caltrans 2024). However, the segments are considered eligible for designation and have not been formally designated. In addition, the Proposed Action would not result in direct or long-term impacts to the transportation network. Any public views of the Russian River that are available from portions of the highway would be improved following implementation of the Proposed Action because natural flows along the Russian River would be restored.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam in the same season. There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam. If the Scott Dam adit were removed and sediment flushed in a year prior to removal of Cape Horn Dam, removal of sediment behind Cape Horn Dam would be required and may extend the construction period. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice. If Cape Horn Dam were removed in a year prior to the removal of Scott Dam, sediment would be released twice and could be diverted to the East Branch Russian River via the NERF diversion. Additionally, the construction period may be extended under this dam removal sequencing option.

In both cases, the visual quality and character of the landscape viewsheds where construction activities would occur would be reduced compared to the No-Action Alternative from the presence of construction equipment at both dam locations regardless of which is removed first. Although the length of the construction period may vary depending on the dam removal sequencing option, the level of significance of the impact would not change. There would be no measurable difference in effects to aesthetic resources from the two alternative sequencing options to the removal of Scott Dam and Cape Horn Dam.

Construction and Environmental Measures

To address and reduce potential effects to visual resources during construction (Phase 1), PG&E would implement the following measures. A complete list of construction measures is provided in Section 2.2.3.

- General Construction Measures, including limiting construction activities to designated work and staging areas; limiting construction work hours; and implementation fugitive dust emission reduction measures

No measures for aesthetics are required for Phase 2 of the Proposed Action as no adverse effects have been identified.

Unavoidable Adverse Effects

Implementation of the Proposed Action would not result in unavoidable adverse effects to aesthetic resources.

References

Caltrans (California Department of Transportation). 2024. California state scenic highway system map. Available at: https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa. Accessed May 2024.

Lake County. 2008. Lake County general plan, open space, conservation, and recreation element. Available at: https://www.lakecountyca.gov/DocumentCenter/View/1640/Chapter-9---Open-Space-Conservation-and-Recreation-PDF. Accessed June 2024.

Mendocino County. 2020. Mendocino county general plan, resource management element. Available at: https://www.mendocinocounty.gov/home/showpublisheddocument/54487/638055061981600000. Accessed June 2024.

National W&SR System (National Wild and Scenic Rivers System). 2024. California. Available at: https://www.rivers.gov/california. Accessed June 2024.

TABLE OF CONTENTS

List of Acronyms

APE	Area of Potential Effects
CFR	Code of Federal Regulations
FERC	Federal Energy Regulatory Commission
mi.	mile(s)
MOA	memorandum of agreement
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
PA	programmatic agreement
Project	Potter Valley Hydroelectric Project
SHPO	State Historic Preservation Office
SA	Study Area
Tribes	California Indian Tribes

This Page Intentionally Left Blank

3.4.1.12 Cultural Resources

This section describes the potential effects to cultural resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), as described in Section 2.2. Section 2.2 includes a description of decommissioning of Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the potential direct and indirect effects to cultural resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam; and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

The area of analysis includes the following cultural resources study areas (SAs) which are also described in Section 3.3.11 and depicted in Maps 3.3.11-1 to 3.3.11-3:

- The Federal Energy Regulatory Commission (FERC) Project Boundary Cultural Resources SA encompasses the FERC Project boundary and a 0.5-mile (mi.) buffer.
- The Eel River SA encompasses the Eel River downstream of Scott Dam to the Pacific Ocean including the Eel River estuary (the SA ends at the Pacific Ocean at the estuary because any sediments from dam removal will be flushed and deposited in the river prior to reaching the estuary mouth) and a 0.5-mi. buffer on either side of the Eel River.
- The East Branch Russian River SA encompasses the East Branch Russian River to Lake Mendocino plus a 0.5-mi. buffer on either side of the East Branch Russian River

In addition to the FERC Project Boundary Cultural Resources SA, the downstream reaches of the Eel and Russian rivers were included as SAs in the evaluation of the affected environment for cultural resources to account for the potential effects of sediment flows from dam removal. PG&E, as delegated by FERC, will develop the Area of Potential Effects (APE) in consultation with the State Historic Preservation Officer (SHPO), Tribes, and stakeholders as part of compliance with Section 106 of the National Historic Preservation Act (NHPA).

Potential Effects

No resource-specific studies have been conducted to help identify the specific effects of the Proposed Action. However, the Proposed Action qualifies as an "undertaking," as defined in Code of Federal Regulations (CFR) Part 800.16(y), with the potential to affect cultural resources that could qualify as historic properties (36 CFR Part 800.3[a]) and must comply with Section 106 of the NHPA to reduce effects to the properties.

The criterion of adverse effect is defined in Section 106 of the NHPA implementing regulations at 36 CFR Part 800.5(a)(1). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Historic properties are defined as any district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. The term includes properties of traditional religious and cultural importance to California Indian Tribes (Tribes) that meet the criteria for inclusion in the NRHP.

Phase 1: Short-term Construction Effects

This section evaluates the potential effects of construction activities on cultural resources as a result of implementation of the Proposed Action (Section 2.2), with incorporation of construction measures. In addition, potential effects of the removal of Cape Horn Dam prior to the removal of Scott Dam are also qualitatively analyzed to provide flexibility in decommissioning of the Project following completion of engineering design.

Construction activities, including dewatering of the reservoirs, required for the decommissioning of Scott Dam and Cape Horn Dam, Project ancillary facilities, and Project recreation facilities in the Scott Dam Area, have the potential to affect cultural resources. Based on review of available information listed in Section 3.3.11, there are cultural resources in both the Scott Dam and Cape Horn Dam areas, including reservoirs, the powerhouse, Project facilities, and associated recreation facilities. Potential adverse effects of Phase 1 short-term construction activities in these areas to cultural resources include:

- Physical destruction of or damage to all or part of the property;
- Effects resulting from the draining of reservoirs that exposes and allows increased access to previously inundated cultural resources, which could result in looting [1]and vandalism;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties (36 CFR Part 68) and applicable guidelines;

1 Looting refers to archaeological looting, which is the illicit removal of artifacts from an archaeological site.

- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; and
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

Phase 2: Post-facility Removal Effects

This section evaluates the potential effects of physical changes that may occur to cultural resources following dam and ancillary/recreation facility removal and the removal of FERC jurisdictional boundaries.

Phase 2a includes analysis of the initial temporary physical conditions that will occur immediately following dam and ancillary/recreation facility removal, including the following:

- Loss of the facility or feature (e.g., loss of reservoir, ancillary facility, or recreation facility).
- Initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam:
  - Pulse hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam until the reservoir is drained; and
  - Sediment load/deposition and turbidity in the Eel River downstream of Scott Dam and Cape Horn Dam.
- Continued degraded water quality and sediment deposition after the initial sediment release until the system stabilizes and water quality and sediment transport return to natural conditions.
- Ground disturbance, use of heavy equipment, and transport of materials to and from the Scott Dam and Cape Horn Dam restoration areas to allow for restoration of the former dam sites and ancillary/recreation facility sites.

Phase 2b includes analysis of the resulting conditions following dam and ancillary/recreation facility removal, including the following:

- Unimpaired hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam;
- Restored sediment transport and water quality in the Eel River downstream of Scott Dam and Cape Horn Dam;
- Natural hydrology in the East Branch Russian River; and
- Restored former reservoir beds and ancillary/recreation sites following facility removal.

The following potential effects to cultural resources that may occur following dam and ancillary/recreation facility removal compared to the No-Action Alternative (existing condition) were evaluated:

- Physical destruction of or damage to all or part of the property;
- Effects resulting from the draining of reservoirs that exposes and allows increased access to previously inundated cultural resources, which could result in looting[2] and vandalism;
- Effects on known and unknown cultural resources due to natural flows and sediment transport, deposition, and erosion;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties (36 CFR Part 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features; and
- Transfer, lease, or sale of a historic property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam in the same season. There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam. If Scott Dam were removed prior to Cape Horn Dam, sediment released from Scott Dam would settle into Van Arsdale Reservoir. Prior to Cape Horn Dam removal, this material would be removed and stockpiled within the construction area.

Sediment releases into Van Arsdale Reservoir and sediment removal and stockpiling of this material have the potential to adversely affect cultural resources within and surrounding Van Arsdale Reservoir through the following potential effects:

- Physical destruction of or damage to all or part of the property;
- Effects on known and unknown cultural resources due to natural flows and sediment transport, deposition, and erosion;

[2] Looting refers to archaeological looting, which is the illicit removal of artifacts from an archaeological site.

- Effects from disturbance and destruction of human remains;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; and
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

If Cape Horn Dam were removed prior to Scott Dam, sediment would be released twice—once following removal of Cape Horn Dam and again following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (see Section 2.2.2). Similar to the previous options, implementation of this option would likely result in a longer disturbance period and would have the same potential adverse effects to cultural resources as those listed above within and surrounding the former Van Arsdale Reservoir. See Section 3.5.1.12 for the cultural resources effects analysis for the new pump station under the Application for Non-Project Use of Project Lands.

Construction and Environmental Measures

To avoid or reduce potential effects to cultural resources:

- Develop an APE in consultation with the permitting agency, SHPO, Tribes, and stakeholders;
- Conduct cultural resource studies to identify and evaluate cultural resources for listing in the NRHP and California Register of Historical Resources[3] within the APE;
- Develop and execute a programmatic agreement (PA) pursuant to 36 CFR 800.14(b)(1)(ii), which stipulates a process for phased identification and evaluation of resources for eligibility for inclusion in the NRHP;
- If needed, develop and execute a memorandum of agreement (MOA) for known resources eligible for inclusion in NRHP to establish the terms and conditions agreed upon to resolve adverse effects (see Resolving Adverse Effects at the end of section); and
- Develop and implement a Historic Properties Management Plan as stipulated in the PA; the plan will provide for the management of properties identified as eligible for listing in the NRHP.

[3] Resources will also be evaluated under the California Register of Historical Resources for use in the State Water Resources Control Board's impacts assessment under the California Environmental Quality Act.

Resolution of Adverse Effects

The process for resolving adverse effects or *Finding of Adverse Effect* will follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with SHPO, Tribes, interested parties, and land-managing agencies; and developing a Section 106 agreement document (typically an MOA or PA that resolves adverse effects).

TABLE OF CONTENTS

List of Acronyms

APE	Area of Potential Effects
CFR	Code of Federal Regulations
CRHR	California Register of Historical Resources
FERC	Federal Energy Regulatory Commission
HPMP	Historic Properties Management Plan
mi.	mile(s)
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SA	study area
SHPO	State Historic Preservation Officer

This Page Intentionally Left Blank

3.4.1.13 Tribal Resources

This section describes the potential effects to Tribal resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), as described in Section 2.2. Section 2.2 includes a description of decommissioning of Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the potential direct and indirect effects to Tribal resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Scott Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

The area of analysis includes the following Tribal resources study areas (SAs) (see also Section 3.3.12):

- Federal Energy Regulatory Commission (FERC) Project Boundary Tribal SA: FERC Project boundary plus a 5-mile (mi.) buffer;
- Eel River Tribal SA: Eel River downstream of Scott Dam to Pacific Ocean including estuary plus a 1-mi. buffer on either side of the river; and
- East Branch of the Russian River Tribal SA: East Branch Russian River from Potter Valley Powerhouse tailrace to Lake Mendocino, plus a 1-mi. buffer on either side of the river.

The FERC Project Boundary Tribal SA where most of the potential direct and indirect effects from Phase 1 construction and Phase 2 post-facility removal may occur includes a 5-mi. study buffer around the FERC Project boundary to provide adequate analysis for Tribal interests and resources. The SAs that include downstream reaches of the Eel River and East Branch Russian River include a 1-mi. buffer on either side of the rivers to encompass any potential effects to Tribal interests and resources from Phase 2 of the Project. PG&E, as delegated by FERC, will develop the Area of Potential Effects (APE) in consultation with the State Historic Preservation Officer (SHPO), Tribes, and stakeholders as part of compliance with Section 106 of the National Historic Preservation Act (NHPA).

Potential Effects

No resource-specific studies have been conducted to help identify the specific effects of the Proposed Action. However, the Proposed Action qualifies as an "undertaking," as defined in Code of Federal Regulations (CFR) Part 800.16(y), with the potential to affect Tribal resources that could qualify as historic properties (36 CFR Part 800.3[a]) and must comply with Section 106 of the NHPA to reduce effects to the properties.

The criterion of adverse effect is defined in Section 106 of the NHPA implementing regulations at 36 CFR Part 800.5(a)(1). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Historic properties are defined as any district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. The term includes properties of traditional religious and cultural importance to California Indian Tribes (Tribes) that meet the criteria for inclusion in the NRHP.

Phase 1: Short-term Construction Effects

This section evaluates the potential effects of construction activities on Tribal resources as a result of implementation of the Proposed Action (Section 2.2), with incorporation of construction measures. In addition, potential effects of the removal of Cape Horn Dam prior to the removal of Scott Dam are also qualitatively analyzed to provide flexibility in decommissioning of the Project following completion of engineering design.

Construction activities, including dewatering of the reservoirs, required for the decommissioning of Scott Dam and Cape Horn Dam, Project ancillary facilities, and Project recreation facilities in the Scott Dam Area, have the potential to affect Tribal resources. Based on review of available information listed in Section 3.3.12, there is a high likelihood of ethnohistoric village locations, archaeological sites, human remains, Tribal ethnobiological resources (plants, animals, avian and aquatic species, and insects), trails, and important Tribal places being present in both the Scott Dam and Cape Horn Dam areas, including reservoirs, the powerhouse, Project facilities, and associated recreation facilities. Potential adverse effects of Phase 1 short-term construction activities in these areas to Tribal communities include:

- Direct effects through physical destruction or damage to all or part of known and unknown Tribal resources;
- Direct and indirect effects through change to the character, use, or physical and sensory setting of known and unknown Tribal resources that diminishes the religious and cultural significance of the resource;

- Direct effects through disturbance and destruction of human remains;
- Direct effects through exposure and erosion of currently submerged ethnographic villages, archaeological sites, and Tribal resources within and surrounding Lake Pillsbury and Van Arsdale Reservoir;
- Direct effects through disruption in access and use of ethnobiological resources, ceremonial areas, and other Tribal activities from construction activities; and
- Indirect effects that may disproportionately affect Tribal communities (see Section 3.4.1.15 for additional information).

Effects on Flows, Water Quality, and Fish and Other Aquatic Species of Tribal Value

As described in Sections 3.4.1.3, 3.4.1.7, and 3.4.1.4, the construction activities have the potential to temporarily impact water quality in the Eel River downstream of Scott Dam and Cape Horn Dam by increasing sedimentation and turbidity, both of which are considered adverse effects. Potential adverse effects of the Proposed Action to flows, water quality, and fisheries from construction activities that may affect Tribal resources include:

- Effects (adverse and beneficial) to native anadromous fish populations such as fall-run Chinook salmon, coho salmon, steelhead trout, and Pacific lamprey, plus freshwater mussels and invertebrates (see Section 3.4.1.04 for a detailed effects analysis for these species); and
- Direct and indirect effects to water use and hydrology, and water quality related to Tribal communities and Tribal resources (see Sections 3.4.1-2 and 3.4.1-3 for additional information).

Phase 2: Post-facility Removal Effects

This section evaluates the potential effects of physical changes to Tribal resources that may occur following dam and ancillary/recreation facility removal and the removal of FERC jurisdictional boundaries.

Phase 2a includes analysis of the initial temporary physical conditions that will occur immediately following dam and ancillary/recreation facility removal, including the following:

- Loss of the facility or feature (e.g., loss of reservoir, ancillary facility, or recreation facility).
- Initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam:
  - Pulse hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam until the reservoir is drained; and
  - Sediment load/deposition and turbidity in the Eel River downstream of Scott Dam and Cape Horn Dam.

- Continued degraded water quality and sediment deposition after the initial sediment release until the system stabilizes and water quality and sediment transport return to natural conditions.
- Ground disturbance, use of heavy equipment, and transport of materials to and from the Scott Dam and Cape Horn Dam restoration areas to allow for restoration of the former dam sites and ancillary/recreation facility sites.

Phase 2b includes analysis of the resulting conditions following dam and ancillary/recreation facility removal, including the following:

- Unimpaired hydrology in the Eel River downstream of Scott Dam and Cape Horn Dam;
- Restored sediment transport and water quality in the Eel River downstream of Scott Dam and Cape Horn Dam;
- Natural hydrology in the East Branch Russian River; and
- Restored former reservoir beds and ancillary/recreation sites following facility removal.

The following potential effects on Tribal resources of physical changes that may occur following dam and ancillary/recreation facility removal compared to the No-Action Alternative (existing condition) were evaluated.

Scott Dam and Cape Horn Dam Areas

- Direct effects through physical destruction or damage to all or part of known and unknown Tribal resources including human remains from sedimentation and erosion, sediment removal, restoration plans, and post-removal activities;
- Direct and indirect effects through change to the character, use, or physical and sensory setting of known and unknown Tribal resources that diminishes the religious and cultural significance of the resource from sedimentation and erosion, sediment removal, restoration plans, and post-removal activities;
- Direct effects through the change in access and use of ethnobiological resources, ceremonial areas, and other Tribal activities;
- Indirect effects that may disproportionately affect Tribal communities (see Section 3.4.1.15 for additional information);
- Direct and indirect effects (adverse and beneficial) to native anadromous fish populations such as fall-run Chinook salmon, coho salmon, steelhead trout, and Pacific lamprey, plus freshwater mussels and invertebrates (see Section 3.4.1.4 for a detailed effects analysis for these species);

Direct and indirect effects to water use, water quality, and hydrology related to Tribal communities and Tribal resources (see Sections 3.4.1-2 and 3.4.1-3 for additional information); and

- Direct and indirect effects from the removal of the FERC jurisdictional boundaries when the license is terminated. Transfer, lease, or sale of a historic property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance is considered an adverse effect.

Eel River Watershed

- Direct effects through physical destruction or damage to all or part of known and unknown Tribal resources, human remains, and the Eel River and its tributaries from sediment flows, removal of sediment, and erosion;
- Direct and indirect effects through change to the character, use, or physical and sensory setting of known and unknown Tribal resources that diminishes the religious and cultural significance of the resource from sediment flows, removal of sediment, and erosion;
- Direct effects through the change in access and use of ethnobiological resources, ceremonial areas, and other Tribal activities within the Eel River Watershed;
- Indirect effects that may disproportionately affect Tribal communities (see Section 3.4.1.15 for additional information);
- Direct and indirect effects (adverse and beneficial) to native anadromous fish populations such as fall-run Chinook salmon, coho salmon, steelhead trout, and Pacific lamprey, plus freshwater mussels and invertebrates (see Section 3.4.1.4 for a detailed effects analysis for these species); and
- Direct and indirect effects to water use, water quality, and hydrology related to Tribal communities and Tribal resources (see Sections 3.3.1.1 and Section 3.3.1.2 for additional information).

Russian River Watershed

- Direct effects through the change in access and use of ethnobiological resources, ceremonial areas, and other Tribal activities within the Russian River Watershed;
- Indirect effects that may disproportionately affect Tribal communities (see Section 3.4.1.15 for additional information);
- Direct effects (adverse and beneficial) to native fish species, freshwater mussels, and invertebrates (see Section 3.4.1.4 for a detailed effects analysis for these species); and
- Effects to water use, water quality, and hydrology related to Tribal communities and Tribal resources (see Sections 3.4.3-2 and Section 3.4.3-3 for additional information).

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam in the same season. There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam. If Scott Dam were removed prior to Cape Horn Dam, sediment released from Scott Dam would settle into Van Arsdale Reservoir. Prior to Cape Horn Dam removal, this material would be removed and stockpiled within the construction area.

Sediment releases into Van Arsdale Reservoir and sediment removal and stockpiling of this material have the potential to adversely affect Tribal resources within and surrounding Van Arsdale Reservoir through the following potential effects:

- Direct effects through physical destruction or damage to all or part of known and unknown Tribal resources;
- Direct and indirect effects through change to the character, use, or physical and sensory setting of known and unknown Tribal resources that diminishes the religious and cultural significance of the resource;
- Direct effects through disturbance and destruction of human remains;
- Direct effects through exposure and erosion of currently submerged ethnographic villages, archaeological sites, and Tribal resources within and surrounding Van Arsdale Reservoir; and
- Direct effects through disruption in access and use of ethnobiological resources, ceremonial areas, and other Tribal activities within and surrounding Van Arsdale Reservoir.

If Cape Horn Dam were removed prior to Scott Dam, sediment would be released twice—once following removal of Cape Horn Dam and again following removal of Scott Dam. Sediment released from Scott Dam would likely be deposited in the former Van Arsdale Reservoir and would result in the need for additional sediment removal activities to allow for the new pump station (see Section 2.2.2). Similar to the previous options, implementation of this option would likely result in a longer disturbance period and would have the same potential adverse effects to Tribal resources as those listed above within and surrounding the former Van Arsdale Reservoir. See Section 3.5.1.13 for the Tribal resources effects analysis for the new pump station under the Application for Non-Project Use of Project Lands.

Construction and Environmental Measures

To avoid or reduce potential effects to Tribal resources:

- PG&E as delegated by FERC will consult with the SHPO, Tribes, and stakeholders to develop an APE for construction effects (Phase 1) and post-facility removal effects (Phase 2).

- PG&E will develop a plan and schedule to conduct a Tribal resources study to identify and evaluate Tribal resources for listing in the NRHP and California Register of Historical Resources (CRHR)[1] within the APE for construction effects (Phase 1) and post-facility removal effects (Phase 2).
- PG&E will develop a management plan according to the Section 106 process such as a programmatic agreement (PA) and/or HPMP that will include additional studies to identify effects and measures to avoid or mitigate adverse effects to Tribal resources. The plan will incorporate results from cultural and Tribal resource studies as well as concurrence on eligibility received from the SHPO. The plan will be reviewed in consultation with FERC, SHPO, Tribes, and stakeholders and will outline implementation procedures such as management roles and responsibilities, Tribal and agency consultation, review requirements, implementation protocols, monitoring, as well as processes for revision of the plan and dispute resolution.
- If needed, PG&E will develop and execute a memorandum of agreement (MOA) for known resources eligible for inclusion in NRHP to establish the terms and conditions agreed upon to resolve adverse effects (see Resolving Adverse Effects at end of section).

To avoid or reduce potential effects to Tribal water quality and fisheries resources from implementation of the Proposed Action, PG&E would obtain, prepare, and/or implement measures and plans identified in Section 3.4.1.3 and Section 3.4.1.4 in consultation with Tribes. These measures and plans would be applied during implementation of the Proposed Action. A complete list of measures is included in Section 2.2.3. Implementation of the Proposed Action would also include obtaining and implementing resource agency and construction permits in consultation with Tribes, following water quality best management practices, and complying with local, state, and federal laws and incorporating Traditional Knowledge. Some of the plans to be implemented include:

- Restoration Plan;
- Construction Site Water Diversion, Dewatering, and Drawdown Plan;
- Construction Aquatic Species Management and Monitoring Plan (including pre-construction surveys and fish rescue and relocation);
- Sediment/Channel Monitoring and Response Plan;
- East Branch Russian River Diversion Plan;
- Construction and Post-Dam Removal Water Quality and Water Temperature Monitoring plans;
- Construction Non-native Invasive Aquatic Species Management Plan;
- Water Quality Best Management Practices;

[1] Resources will also be evaluated under the CRHR for use in the State Water Board's impacts assessment under the California Environmental Quality Act.

- Hazardous Materials Handling Measures;
- Post-Dam Removal Aquatic Species Management and Monitoring Plan; and
- Estuary Protection Plan.

Resolution of Adverse Effects

The process for resolving adverse effects or *Finding of Adverse Effect* will follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with the SHPO, Tribes, interested parties, and land managing agencies; and developing a Section 106 agreement document (typically a MOA or PA) that resolves adverse effects.

Beneficial Effects

See Sections 3.4.1.4 and 3.4.1.8 for long-term beneficial effects to native fisheries and Eel River flows and sediment processes.

TABLE OF CONTENTS

List of Tables

List of Acronyms

BMP	best management practices
Caltrans	California Department of Transportation
cfs	cubic feet per second
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
PVID	Potter Valley Irrigation District
SPCC	Spill Prevention, Control, and Countermeasures
USACE	U.S. Army Corps of Engineers

This Page Intentionally Left Blank

3.4.1.14 Socioeconomic Resources

This section describes the potential effects to socioeconomic conditions and values that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning of Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). The effects are determined by analyzing the changes in socioeconomic conditions and values that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1). Two alternate sequencing options to remove Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider construction measures and post-facility removal measures included to avoid or mitigate impacts associated with the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

The following potential effects to socioeconomics resulting from Project facility modifications during construction and post-facility removal were evaluated:

- Water reliability and cost;
- Energy reliability and cost;
- Economic opportunity (income and employment);
- Population and housing effects;
- Recreation value;
- Community way of life;
- Local government stability and fiscal conditions; and
- Habitat and species-related cultural and economic values.

Phase 1: Short-term Construction Effects

Water Reliability and Cost

The Proposed Action may affect the quality and quantity of water available, which may affect the reliability and cost of water for economic uses in the socioeconomics study area.

Scott Dam Area

There are no expected effects on water reliability or cost in the Scott Dam Area as there are no known surface or authorized water diversions from the reservoir that would be affected by the Proposed Action. Water from Lake Pillsbury is currently used for fire suppression; see Section 3.4.1.9 for further information on fire suppression.

Cape Horn Dam Area

There are no expected effects on water reliability or cost in the Cape Horn Dam Area as there are no known surface water diversions from Van Arsdale Reservoir that would be affected by the Proposed Action.

Eel River Watershed

Construction activities at Scott Dam and Cape Horn Dam have the potential to temporarily impact water quality in the Eel River downstream of the dams. Higher sediment and other pollutants in the Eel River Watershed during and immediately after construction (see Section 3.4.1.3) could affect downstream surface water users and increase surface water system maintenance and water treatment costs. However, groundwater is the primary water source in the Eel River Watershed, with minor surface water diversions for agriculture and municipal use from the Eel River. According to the Humboldt County Department of Public Works, surface water consumption constitutes approximately 0.01 percent of the Eel River Valley basin's surface water outflow (Humboldt County Department of Public Works 2022).

Surface water diversions for agricultural use averaged 117 acre-feet annually from 2011 to 2020 (compared to 12,338 acre-feet annually of groundwater pumping for irrigation), while total municipal surface water diversions in the Eel River Valley basin by the City of Rio Dell and Scotia Community Services District averaged 824 acre-feet (compared to 1,733 acre-feet on average of municipal groundwater pumping in this time period for all municipalities in the Eel River Valley basin) (Humboldt County Department of Public Works 2022). If there were adverse effects on water quality in the Eel River during construction, there could be localized adverse effects on water reliability and costs in City of Rio Dell and Scotia Community Services District.

However, to address and reduce potential impacts to water quality during construction, PG&E would include water quality and erosion control measures that would be implemented at the construction activity locations in the vicinity of Scott Dam and Cape Horn Dam. Construction measures include a Construction Site Water Diversion, Dewatering, and Drawdown Plan, Construction Water Quality and Water Temperature Monitoring Plan, Stormwater Pollution Prevention Plan, Construction Erosion Prevention Plan, and best management practices (BMPs). PG&E would also implement Hazardous Materials Measures to avoid or minimize the risk of soil contamination from accidental spills that could enter waterways. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan, with protocols for preventing spills and managing incidents should they occur. PG&E would implement measures for containment of human waste at all construction activity locations, including port-a-johns with secondary containment to prevent contaminants from entering the waterway. In addition, PG&E would obtain applicable resource agency and construction permits. With implementation of these measures, the potential for water quality effects would be negligible for the City of Rio Dell and Scotia Community Services District (as well as elsewhere in the watershed where there may be very limited surface water diversions).

Russian River Watershed

Water reliability and cost in the Russian River Watershed may be affected during construction if inter-basin transfers of water from the upper Russian River Watershed to the East Branch Russian River cease. These water transfers may increase, or they may cease temporarily during construction (see Section 3.4.1.2). During construction, if the upstream cofferdam at Cape Horn Dam is installed in the Eel River above the Van Arsdale Diversion, the diversion would not be operable and diversions into the East Branch Russian River would cease. PG&E would develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. With this plan, effects on water reliability and cost in the Russian River Watershed are expected to be negligible during construction.

Energy Reliability and Costs

The Proposed Action may affect hydropower generation at various small hydropower plants (non-Potter Valley Project) in the study area due to possible changes in flows during construction in the Russian River Watershed, which may affect the reliability and cost of energy in this area. Generation at the Potter Valley Powerhouse was discontinued in 2021.

Scott Dam and Cape Horn Dam Areas

There is currently no energy produced from Project facilities, so there is no direct expected effect on local energy production or associated reliability or cost in the Scott Dam or Cape Horn Dam areas.

Eel River Watershed

There are no hydropower facilities in the Eel River Watershed that would be affected by the Proposed Action, so there are no effects on energy reliability or costs in this area.

Russian River Watershed

Water diverted by the Project into the Russian River basin has the ancillary benefit of increasing flows through downstream hydropower production facilities (owned by the City of Ukiah and private entities) and thereby increasing energy production in these facilities. If inter-basin transfers of water continue throughout construction, then the Proposed Action would have no effects on energy reliability and costs. During construction, if the upstream cofferdam at Cape Horn Dam is installed in the Eel River above the Van Arsdale Diversion, the diversion would not be operable and diversions into the East Branch Russian River would cease. PG&E would develop an East

Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. With the implementation of this plan, the impact on generation at the downstream hydropower production facilities during construction would be negligible.

Potential effects on energy reliability if Project inter-basin transfers cease after dam removal are discussed below in the energy reliability section under Phase 2: Post-facility Removal Effects.

Economic Opportunity (Income and Employment)

Construction spending could spur short-term local economic activity, directly and indirectly supporting economic opportunity in the four-county socioeconomic study area (Lake, Mendocino, Sonoma, and Humboldt counties). However, reduction in recreational opportunities during construction could decrease recreation-related economic activity and opportunity in the immediate Project area (this effect would be limited as there are few businesses and amenities in the immediate Project area).

The magnitude of jobs and income supported by construction activities depends on several factors, including the total construction budget, the proportion of the construction budget for labor versus materials/equipment, and the source location of construction labor, equipment, and materials (i.e., sourced locally or from outside the region). The effect on economic opportunity for residents in the study area would increase with higher levels of total construction spending, higher proportion of budget spent on labor, and higher proportion of labor and materials sourced from within the region. Data on these three key factors are not available for this analysis.

Existing estimates from other sources of possible Project construction spending and associated economic impact from dam removal were obtained. The Bay Area Council Economic Institute (2023) estimated that approximately 810 construction-related jobs could be supported in the region for 1 year (referred to as job-years in the study) during dam removal and restoration (Bay Area Council Economic Institute 2023). This analysis by the Bay Area Council Economic Institute (2023) further estimated that approximately 500 additional jobs lasting for 1 year could be supported in related sectors (indirect and induced effects of spending rippling through other economic sectors), for a total economic impact of approximately 1,300 job-years supported in the region (Table 3.4.1.14-1). The employment estimates by Bay Area Council Economic Institute (2023) were rounded to the nearest 50 jobs as the actual construction spending would likely differ from the estimates used in the study and the actual economic impacts would differ accordingly. Actual employment impacts during construction would vary from these estimates presented in Table 3.4.1.14-1 based on the key factors noted above regarding the magnitude, type, and location of construction spending.

Table 3.4.1.14-1. Potential magnitude of construction-related employment effects in the study area based on Bay Area Council Economic Institute (2023).

Construction Component	Direct (Job-Years, Construction Sectors)[1]	Induced and Indirect (Job-Years, Other Sectors)[1]	Total Employment (Job-Years, All Sectors)[1]
Scott Dam Removal	500	300	800
Cape Horn Dam Removal	300	200	500
Total	**800**	**500**	**1,300**

Source: Bay Area Council Economic Institute 2023

[1] All employment estimates in this table and in the text have been rounded to the nearest 50 jobs as the actual construction spending will likely differ from the estimates in the 2021 feasibility study and the actual economic impacts will differ from those in the 2023 economic study.

Not all of these jobs would be supported at the same time if the dam removal is phased over time. The construction period for Scott Dam removal would be approximately 2 years while the construction period for Cape Horn Dam removal would be approximately 1 to 1.5 years. PG&E is expected to initiate the removal of Scott Dam and Cape Horn Dam during the same low-flow season (thus in any 1 year, there could be employment effects from removal of both dams). Table 3.1.14-2 combines this construction schedule with the results from the Bay Area Council Economic Institute's economic analysis estimates presented in Table 3.4.1.14-1 to show the potential magnitude of average employment impacts in the study area during any 1 year. Since two 2 job- years may represent one job supported over two 2 years, it is important to consider the duration of the construction period. This analysis assumes that construction employment would be evenly spread across the construction period. Accordingly, the final columns in Table 3.4.1.14-2 present the results of dividing the total job-year estimates (from Table 3.4.1.14-1) by the duration of the potential construction period to show the potential average number of jobs that may be supported in any 1 year during construction. The final row in the table presents a low range (if dam removal is staggered) and a high range (if both dams are removed simultaneously).

Table 3.4.1.14-2. Potential duration and annual magnitude of construction-related employment effects in the 4-county study area based on Bay Area Council Economic Institute (2023).

Construction Component	Potential Construction Duration (Years)	Annual Average Direct Construction Employment (Supported in Any 1 Year)	Annual Average Total Employment in all Sectors (Supported in Any 1 Year)
Scott Dam Removal	1.5 to 2.5	200 to 350	300 to 550
Cape Horn Dam Removal	1 to 1.5	200 to 300	300 to 500
Total	**2.5 to 4**	**200 to 650**	**300 to 1,150**

Source: Bay Area Council Economic Institute 2023

Note: All employment estimates in this table and in the text have been rounded to the nearest 50 jobs as the actual construction spending will likely differ from the estimates in the 2021 feasibility study and the actual economic impacts will differ from those in the 2023 economic study.

The effects during construction on economic opportunity by study area region are described below.

Scott Dam Area

Construction economic activity would occur at Scott Dam and would increase employment and jobs in this area. However, given how remote the area is, it is expected that most construction labor, services, and equipment would be sourced from farther away, from more urban areas, limiting the increase in economic activity experienced by current residents and businesses in the Scott Dam Area. There are a few service businesses and lodging facilities/vacation homes in this area that could provide limited services and accommodations to construction workers.

Recreation and tourism-related economic activity in the Scott Dam area may decline or cease altogether during construction because Project recreation facilities would be closed and removed, and vacation homeowners may choose to avoid the area during the construction period. However, there are few amenities and businesses in the Scott Dam Area, which would limit the effects of construction on economic opportunity (i.e., the total number of jobs and associated income affected is expected to be small). Thus, while the overall effect is expected to be minor, there could be adverse effects on economic opportunity for the few businesses near Scott Dam during construction, which could even include ceasing operations for the short-term.

Cape Horn Dam Area

Construction-related economic activity would occur at Cape Horn Dam and would increase construction employment and jobs in this area, as described above. However, there are no population centers near the Cape Horn Dam Area that would supply construction labor or specialized materials/equipment for the Proposed Action. As such, the jobs and income supported by construction would likely accrue to residents of other areas, which may include residents of other counties in the study area.

There is some recreation supported in the Cape Horn Dam Area, which would likely decline or cease during construction as facilities would be closed during the construction period. The Trout Creek Campground would be transferred to a third party, and it is assumed that it may be closed for the construction period and would open again after work is complete. However, recreation visitation is limited in this area (see Table 3.4.1.14-3). Therefore, negligible effects on economic opportunity are expected for businesses near Cape Horn Dam. In sum, there are expected to be negligible effects on economic opportunity for businesses and households near Cape Horn Dam.

Eel River Watershed

Due to the lack of population centers in the Eel River Watershed that could be used to source construction labor or supplies/services for the Proposed Action, there would likely be negligible effects on economic opportunity in this area.

Economic opportunity in the Eel River Watershed associated with recreation may be affected during construction. Flows in the Eel River are expected to increase during construction, including during the drawdown of the reservoir and after the dam lowering/spillway notching, when natural flows would pass over the dam into the Eel River (as there would be no storage; see Section 3.4.1.2 and Table 3.4.1.2-1). If high flows pass over the lowered dam, their magnitude would be expected to be within the range that has occurred under existing conditions (see Section 3.4.1.2). As discussed above, PG&E would implement several measures to address and reduce potential effects to water quality during construction, and therefore, the potential for increase in turbidity and suspended sediment and related water quality effects on recreation opportunity are expected to be negligible. The net effect on recreation opportunity during construction is likely negligible as recreation businesses and recreationists may need time to adjust to new flow conditions before visitation and associated recreation spending are affected.

Negligible effects on economic opportunity associated with changes in water supply or water quality for water users are expected in the Eel River Watershed during construction, as the volume of surface water used for economic activities is a small portion of total water use in the watershed.

In sum, the effects of construction on economic opportunity in the Eel River Watershed during construction are expected to be negligible.

Russian River Watershed

Construction workers, materials, and equipment may be sourced from population centers in the Russian River Watershed, particularly the city of Ukiah. Non-local construction workers may also temporarily relocate and stay in the area, increasing demand for services from local businesses and increasing economic opportunity in the area.

As presented in Section 3.4.1.2, if the upstream cofferdam to dewater the work area at Cape Horn Dam is installed upstream of the Van Arsdale Diversion, PG&E would develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. With the implementation of this plan, the impact on water supply during construction would be negligible.

In sum, the effects on economic opportunity in the Russian River Watershed during construction are expected to be beneficial from construction worker spending and from continued inter-basin transfers of water during construction.

Population and Housing Effects

To analyze potential population and housing effects during construction, the evaluation below focuses on how increased demand for construction workers (as presented above) may affect population and housing. Employment effects in other sectors, such as restaurants, hotels, and other service industries that support construction work, are much less likely to affect the population and associated housing demand in the region because these jobs are more likely to benefit existing residents and not significantly affect migration to the region.[1] Based on the study by Bay Area Council Economic Institute (2023) and shown in Table 3.1.4.14-2, the direct construction employment at any one time in the study area may be 200 to 650 workers. A portion of construction workers may be local residents and a portion may be from elsewhere, moving temporarily to the region during construction and thereby temporarily increasing the local population.

The magnitude of such a short-term population effect would vary depending on the total number of construction jobs, the proportion of construction jobs filled by non-residents who move to the area, and the number of people relocating to the region with each non-local worker. As an illustrative example, if half of construction workers were to be non-local, this would be an increase at any one time of approximately 100 to 325 workers in the study area. Construction workers may relocate by themselves or with household members. If an average of one additional person accompanies each construction worker, this would be an increase of 200 to 650 people in the study area. The actual effect on the study area population during construction may be higher or lower than this potential range of 200 to 650 new residents, depending on the factors noted above.

Scott Dam Area

Summer homes, recreational campgrounds, and other lodging options near Lake Pillsbury and elsewhere in Lake County may be used by construction workers. There are approximately 300 single-family homes, including the Lake Pillsbury homesite tract, Lake Pillsbury Ranch, Ricefork and Westshore in the Lake Pillsbury basin (Lake Pillsbury Alliance n.d.). As of the 2020 census, in Lake County in Census Tract 1 (that extends from Sanhedrin Mountain to the north to Clear Lake in the south and includes Lake Pillsbury as well as other towns such as Lakeport, Soda Bay, and Clearlake, see Map 3.3.14-1 in Section 3.3.14) there are an estimated 1,549 housing units, of which 1,320 were occupied, leaving approximately 229 housing units (or 15 percent) vacant. Local construction workers could rent homes, stay at the local recreational campgrounds, or stay at other lodging in this area. In this case, increased demand for housing and lodging in the area could partially or wholly offset decreased recreation/tourism demand during construction. The net effect on the local population between potential decreased demand from recreation/tourism/vacation homeowners and potential increased demand for construction worker housing is expected to be negligible.

Cape Horn Dam Area

No effect on housing or population is expected in the vicinity of Cape Horn Dam as few if any construction workers are expected to lodge near Cape Horn Dam due to the lack of housing and lodging facilities.

---

1 This is for several reasons. First, employment in other sectors is likely much more dispersed among many workers. For example, one full-time equivalent job supported in the restaurant sector may actually be experienced as an increase in workload spread across four different workers in four different restaurants, with no actual increase in employment (although there is an increase in income and productivity). Second, firms know that an increase in demand for their services related to the Proposed Action is short term. As such, firms may choose to meet the additional demand without hiring additional workers.

Eel River Watershed

Due to the lack of population centers in the Eel River Watershed near the dams, it is unlikely that many non-local construction workers would lodge in this area. There are little to no expected effects on housing or population in the Eel River Watershed.

Russian River Watershed

Construction workers from outside the region may choose to reside in different locations throughout the study area, potentially affecting the population and associated lodging or housing demand in nearby towns or communities in any of the study area counties. Alternatively, if workers are spread among the counties in the study area, no single town or city would be affected. The city of Ukiah is a likely base for many relocated construction workers given its proximity and size. As presented in Table 3.3.13-2, the city's population is estimated at approximately 16,500 people. While the construction workforce and associated household members may be much smaller, the maximum population increase of up to 650 people in Ukiah (using the data from the Bay Area Council Economic Institute on construction employment and the assumptions discussed above regarding the proportion of the workforce that may be non-local) if all non-local workers relocate to Ukiah represents approximately 4 percent of the current population.

With regard to housing, as of the 2020 U.S. census, there were 6,952 housing units in Ukiah, of which 368 or 5 percent were vacant (U.S. Census Bureau 2020). For comparison, across California as a whole, approximately 6 percent of housing units were vacant in the 2020 U.S. census (U.S. Census Bureau 2020). If, on the high side, up to 325 households relocated to Ukiah during construction and chose to live in one of these homes rather than lodge in a motel or hotel, then construction worker households could occupy most of the vacant homes. While increased demand for housing tends to increase housing prices, the effect of temporary construction workers on housing prices in the study area would likely be minimal, given that a short-term construction project would not likely cause a worker to purchase a house in the area and the number of relocated construction workers relative to the overall population in Ukiah and elsewhere in the study area would be relatively small. In sum, construction effects on population and housing throughout the Russian River Watershed are expected to be negligible.

Recreation Value

At Scott Dam, construction activities include the initiation of the reservoir drawdown after the runoff season when inflows would be generally below 400 cubic feet per second (cfs). The reservoir storage at the start of the drawdown period (June) would be approximately 50,000 acre-feet (ac-ft). Completion of the drawdown to approximately 10,000 ac-ft of storage at an elevation of 1,861.7 ft. would occur by October. This drawdown would likely affect value associated with certain types of water-based recreation opportunity to recreationists throughout the study area during construction. The magnitude of effect of the Proposed Action on recreation value depends on how the Proposed Action would change the quality and quantity of recreation opportunity and how this would affect recreation visitation and value to the recreationists per visit. This section estimates change in value to recreators based on the current recreation visitation level (visitor days), estimates of how the number of visitor days may change with the Project, and estimated average value per recreation visitor day.

Scott and Cape Horn Dam Areas

Under the Proposed Action, Project recreation facilities would be removed in the Scott Dam Area and recreation activity in the area would be prohibited during construction (see Section 3.4.1.10). As such, this section estimates the adverse effect of Proposed Action construction on short-term recreation value based on the total value of current recreation visitation that would no longer be available in the study area.

Estimates of recreation visitation at PG&E recreation facilities Van Arsdale Reservoir and Lake Pillsbury are available in the Federal Energy Regulatory Commission (FERC) relicensing pre-application document for the Project (PG&E 2017) and are presented in Table 3.4.1.14-3 below. Data were collected and reported to FERC by PG&E every 6 years, so the recreation visitation data are available only for 2002, 2008, and 2014. As shown in Table 3.4.1.14-3, recreation visitation at Lake Pillsbury during that time period varied substantially from year to year, but on average was estimated at approximately 60,000 visitor days (one person for one day) annually, while average visitation at Van Arsdale Reservoir was estimated at approximately 4,000 visitor days annually.

Table 3.4.1.14-3. Lake Pillsbury and Van Arsdale Reservoir annual recreation visitation and value (in 2024 dollars) for 2002, 2008, and 2014.

Reservoir/Year	Time Period of Recreation Count	Visitor Days			Estimated Annual Average Recreation Value
		Campers	Day Users	Total	
Pillsbury					
2002	5/1–9/30	67,500	20,300	87,800	$2,630,000
2008	5/1–9/5	35,000	21,500	56,500	$1,700,000
2014	5/1–9/5	22,106	12,444	34,550	$1,040,000
Average		41,535	18,081	59,617	**$1,790,000**
Van Arsdale					
2002	4/26–9/5	500	2,000	2,500	$80,000
2008	5/1–9/5	2,700	2,300	5,000	$150,000
2014	5/1–11/15	1,705	2,836	4,541	$140,000
Average		1,635	2,379	4,014	**$120,000**

Sources: California Department of Parks and Recreation 2014; Pacific Gas and Electric Company 2017; Rosenberger *et al.* 2017; USACE 2018.

Sources in the economic literature vary in their estimates of the net value to recreationists per visitor day,[2] but for general motorized boating, camping, swimming, and picnicking activities, estimates tend to be between $10 to $50 per day (see California Department of Parks and Recreation 2014; Rosenberger *et al.* 2017; U.S. Army Corps of Engineers [USACE] 2018). Using an average value or net benefit to recreationists of $30 per visitor day, current recreation visitation at Lake Pillsbury may have an average recreation value of approximately $1.8 million annually, while recreation value at Van Arsdale Reservoir may have an average recreation value of approximately $0.1 million annually. Assuming that absolutely no recreation would be carried out at the reservoirs during the construction period, this represents the magnitude of the potential adverse effect on recreation value to recreationists in the Scott Dam and Cape Horn Dam areas. To the extent that recreationists shift recreation to other area reservoirs, lakes, and recreation sites during construction, the overall adverse effect on recreationists may be lower.

<u>Eel River Watershed</u>

Flows in the Eel River are expected to increase during construction (see Section 3.4.1.2.), which may enhance recreation opportunities in the Eel River. However, water quality would decline temporarily due to sediment released from the Project reservoirs, which could adversely affect recreation and associated economic opportunity. As discussed above, PG&E would implement several measures to address and reduce potential effects to water quality during construction, and, therefore, effects to water quality are considered negligible. If river-based recreation activities are halted on the Eel River during construction, effects on recreation would be adverse. Otherwise, the net effect on recreation during construction is likely negligible as recreation businesses and recreationists may need time to adjust to new flow conditions before visitation and associated recreation spending is affected.

<u>Russian River Watershed</u>

As presented in Section 3.4.1.2, if the upstream cofferdam to dewater the work area at Cape Horn Dam is installed upstream of the Van Arsdale Diversion, PG&E would develop an East Branch Russian River Diversion Plan that could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. With the implementation of this plan, the impact on the value of recreation during construction would likely be negligible.

Community Way of Life

The addition of temporary construction workers for a short period of time may affect community identity and community way of life. However, given the relatively small number of expected construction workers at any one time as a percent of the city of Ukiah or other locations within the study area where temporary workers may reside, the effects of population change on the community way of life throughout the study area are expected to be negligible. Other types of effects on community way of life are expected throughout the study area, as described below.

---

[2] The net value to recreators, or consumer surplus, is the value of the recreation experience less any costs of the experience such as fees paid for recreation or travel costs.

Scott Dam Area

Residents, visitors, and businesses proximate to the reservoirs would likely experience aesthetic, recreation, noise, vibration, and potential dust impacts during construction activities that could adversely impact community way of life (see Sections 3.4.1.10, 3.4.1.11, 3.4.1.16, 3.4.1.17, and 3.4.1.18 for further descriptions of these types of impacts). Construction activities are anticipated to last approximately 2 years at Scott Dam and approximately 1 to 1.5 years at Cape Horn Dam. According to the Lake Pillsbury Alliance, the Lake Pillsbury basin includes about 450 homeowners and ranches (Lake Pillsbury Alliance n.d.). There are approximately 3,500 people residing in the entire census tract surrounding Lake Pillsbury, which also includes towns such as Lakeport, Soda Bay, and Clearlake, see Map 3.3.14-1 in Section 3.3.14. The community way of life of these people, particularly those living or recreating near Lake Pillsbury, may be adversely affected during construction from aesthetic, recreation, noise, vibration, and potential dust impacts, resulting in adverse effects to socioeconomic resources.

Cape Horn Dam Area

Residents, visitors, or businesses in the Cape Horn Dam Area would experience similar disruptions and impacts during construction as those described above for the Scott Dam Area. However, as there are few residences near Van Arsdale Reservoir, the effects of these types of disruptions on community quality of life in this census tract are expected to be negligible.

Eel River Watershed

Similar to the Cape Horn Dam Area, communities in the Eel River Watershed could experience temporary effects related to transportation networks. However, measures enacted to address these issues would reduce such effects, with negligible impacts on community way of life.

Russian River Watershed

Project effects on community way of life in the Russian River Watershed would be negligible since there are no direct construction activities in the watershed and all other socioeconomic indicators discussed above would be negligible due to the implementation of the East Branch Russian River Diversion Plan, which could provide diversions to the East Branch Russian River during construction.

Local Government Stability and Fiscal Conditions

Local government revenues fund public services such as highways and streets, public safety, economic development, health and welfare, culture and recreation, and education. Local economic activity in the study area, and associated sales and lodging taxes, support local governmental stability and fiscal conditions. Additionally, property values and associated property taxes support local government stability and fiscal conditions. See Table 3.3.13-6 for details on county revenue sources.

Scott Dam Area

As described above, recreation and tourism spending associated with reservoir-based recreation and tourism at Lake Pillsbury would be expected to decline during construction, with potential short-term adverse effects on Lake County local government revenue sources such as sales tax and lodging tax. However, there would potentially be two effects that may offset these adverse effects. First, if construction workers are from Lake County or relocate to Lake County and/or the Proposed Action sources materials and equipment from Lake County, the net short-term effect on Lake County local government revenues associated with economic activity levels may be negligible to beneficial. Second, if recreationists and tourists shift their spending from the region around Lake Pillsbury to other locations within Lake County (or shift spending to river-based recreation in the Project area) and do not decrease total spending in Lake County, there would be no adverse effects at the county level associated with reduced tourism spending.

The Proposed Action could result in temporary increased demand for local and county emergency services in support of safety during construction activities, but these would be reduced with adherence to the public safety plan and could be similar to other large construction projects in the region. The Proposed Action could also result in increased costs of obtaining water for local fire suppression (since Lake Pillsbury is a source of water for fire suppression) or increased road or other infrastructure maintenance costs to local governments. However, a Post-construction Road Restoration Plan would be implemented post-construction, with measures to assess road conditions and actions to remediate damage. All roadways within the FERC Project boundary would be restored to existing condition as part of PG&E construction to facilitate continued safe access to the construction areas. The use of roadways outside of the FERC Project boundary may require transportation permits from California Department of Transportation (Caltrans) (e.g., oversized/overweight or variance permit) and potentially Forest Service and county permits. Required permits contain measures designed to minimize damage to existing roadways and would include restoration requirements where damage is incurred. Therefore, road damage and costs associated with repairs to local governments resulting from construction vehicle use is considered negligible. Potential long-term effects on property values and associated tax revenues are discussed below under Phase 2: Post-facility Removal Effects.

Cape Horn Dam Area

While construction activity would occur at Cape Horn Dam, there is little to no expected change in economic activity at local businesses in the area, so there are no changes in local government tax revenues associated with the Proposed Action in this area.

However, as with the Scott Dam Area, the Proposed Action could result in increased demand for local and county emergency services in support of safety during construction activities, but these would be reduced with adherence to the public safety plan and could be similar to other large construction projects in the region. Further, the Proposed Action could result in increased road or other infrastructure maintenance costs to local governments. A Post-construction Road Restoration Plan would be implemented that would assess road conditions and take actions to remediate damage. All roadways within the FERC Project boundary would be restored to existing condition as part of PG&E construction to facilitate continued safe access to the construction areas. The use of roadways outside of the FERC Project boundary may require transportation permits from Caltrans (e.g., oversized/overweight or variance permit) and potentially Forest Service and county permits. These permits would contain measures designed to minimize damage to existing roadways and would include restoration requirements where damage is incurred. Therefore, costs to local governments of road damage and associated repairs resulting from construction vehicle use are considered negligible.

Eel River Watershed

Flows and water quality in the Eel River are expected to change during the construction period (see Section 3.4.1.2 and Section 3.1.4.3), which may affect aesthetics and recreation. As these are short-term effects during construction, here would likely be a negligible effect on property values and associated effects on property tax revenues to local governments during the construction period.

Russian River Watershed

As described above, economic activity (and associated local government tax receipts) in the Russian River is affected by the reliability and cost of water. The East Branch Russian River Diversion Plan could include pumping to the diversion tunnel, if needed, to provide diversions to the East Branch Russian River during construction. Under this plan, inter-basin transfers from the Eel River Watershed to the Russian River Watershed would continue undiminished during construction, so there are negligible expected effects on local government stability and fiscal conditions in the Russian River Watershed during construction.

Habitat and Species-Related Cultural and Economic Values

As described in Section 3.4.1.4, effects on habitat and species in the Project area under the Proposed Action compared to the No-Action Alternative would likely be adverse during construction. Potentially affected species with Tribal cultural value and socioeconomic value to other communities include Pacific lamprey, Chinook salmon, coho salmon, steelhead, green sturgeon, northwestern pond turtle, and freshwater mussels. Potential adverse effects to these fish and wildlife species would be particularly experienced by conservationists, Tribal members, and others who value species and habitat conservation. People may value aquatic habitat and species conservation due to cultural values, personal beliefs and moral ethics (i.e., believing protecting a species and its habitat is the right thing to do), altruism (i.e., believing a resource should be protected so that others can use it or benefit from it), and/or a desire to bequeath the resource (i.e., believing a resource should be protected for future generations). Measures to reduce effects to aquatic species and habitats include an East Branch Russian River Diversion Plan, a Construction Aquatic Species Management and Monitoring Plan, and a Construction Water Quality and Water Temperature Monitoring Plan (see Sections 3.4.1.3 and 3.4.1.4). These plans would be developed to mitigate the effects of the Proposed Action on fish and aquatic resources in the Eel River and East Branch Russian River, resulting in expected minor adverse effects to socioeconomic values.

While the economic cost of the Proposed Action on aquatic species and their habitats cannot be quantified, it would likely be adverse.

Phase 2: Post-facility Removal Effects

Post-facility removal effects to socioeconomic values and conditions resulting from physical changes may occur following removals of the dams and recreation facilities/ancillary facilities (Phase 2) compared to the No-Action Alternative (existing condition). Effects on the same set of socioeconomic values evaluated for construction (Phase 1) are evaluated for the post-facility removal period.

Water Reliability and Cost

The Proposed Action may affect the quality and quantity of water available, which may affect the reliability and cost of water for economic uses in the study area.

Scott Dam Area

There are no expected effects on water reliability or cost in the Scott Dam Area as there are no known surface water diversions that would be affected by the Proposed Action. Water from Lake Pillsbury is currently used for fire suppression; see Section 3.4.1.9 for further information on fire suppression.

Cape Horn Dam Area

There are no expected effects on water reliability or cost in the Cape Horn Dam Area as there are no known surface water diversions that would be affected by the Proposed Action.

Eel River Watershed

Currently, a very limited portion of Eel River flows are diverted and used for water supply. After the construction period and flushing of sediment through the river system, water quality effects in the Eel River are expected to subside. With natural flows restored in the Eel River, over the long term, there may be a beneficial effect on water quality in the Eel River Watershed. Over the long term, there would be negligible effects on water reliability or cost to downstream surface water users.

Russian River Watershed

Post-construction, there would be no Project inter-basin transfers of water, so there would be an adverse effect on agricultural water reliability and cost in the Russian River Watershed, particularly in Potter Valley Irrigation District (PVID) and downstream agricultural areas. Figure 3.4.1.2-3 shows modeled flow releases into the East Branch Russian River with average and maximum PVID diversions. Depending on how water management would shift with cessation of Project inter-basin transfers, there may also be an adverse effect on municipal and industrial water reliability and/or cost in the upper Russian River Watershed. Water supply scenarios developed by Highland Economics (2020) to inform a 2020 economic analysis of the Project indicated that without Project inter-basin transfers, agricultural water supply would be reduced in all reaches from the Potter Valley Powerhouse outlet down to Healdsburg (Highland Economics

2020). This same analysis by Highland Economics (2020) found that unless minimum instream flows and reservoir levels were modified, municipal and industrial water supply would also be reduced by 20 percent on average, with greater reductions in dry water years (Highland Economics 2020). Based on the Highland Economics (2020) study, these reductions can result in numerous costs for water users, including increased cost to procure alternate sources and costs of curtailment. However, if inter-basin transfers of water are continued (see Section 3.4.1.2) and/or if alternative water supplies can be obtained, this effect could be negligible.

Energy Reliability and Cost

The Proposed Action may affect hydropower generation in the study area, which may affect the reliability and cost of energy in the study area. Generation at the Potter Valley Powerhouse was discontinued in 2021.

<u>Scott Dam and Cape Horn Dam Areas</u>

There is currently no energy produced from Project facilities, so there is no direct expected effect on local energy production or associated reliability or cost in the Scott Dam or Cape Horn Dam areas.

<u>Eel River Watershed</u>

There are no hydropower facilities in the Eel River Watershed that would be affected by the Proposed Action, so there are no effects on energy reliability or costs in this area.

<u>Russian River Watershed</u>

Under the Proposed Action, post-construction, inter-basin transfers of water from the Eel River to the Russian River would cease. Depending on future water management strategies, flows in the Russian River may decrease. If flows through hydropower facilities on the Russian River decrease, then energy production by these facilities may also decrease, depending on the water management strategies in use at these facilities. There may, therefore, be localized adverse effects on the cost of energy to hydropower plant owners in the Russian River Watershed, which may be passed on to consumers. However, the relatively small capacity of these hydropower facilities relative to total energy demand in the region and the relatively small volume of inter-basin transfers relative to total Russian River flows limit hydropower effects. Therefore, the potential effects on energy reliability and costs throughout the Russian River Watershed would be negligible (although effects on energy costs to hydropower entities may be adverse unless inter-basin transfers of water are continued; see Section 3.4.1.2).

Economic Opportunity (Income and Employment)

Project operations directly support little economic activity and Proposed Action construction economic activity would cease following dam removal, so in the long term there would be few jobs directly affected by the Proposed Action. However, there would be effects on economic activity due to the change from a lacustrine to riverine environment and the return to unimpaired hydrology in the Eel River and East Branch Russian River. Water resources are used for out-of-stream consumptive uses such as agriculture, residential, and municipal uses, as well as for instream recreation/aesthetic/habitat conditions important to the recreation and tourism industries and the commercial fishing industries, with consequent effects on employment and income.

Scott Dam

As discussed above, the aesthetics and recreation opportunities at Lake Pillsbury attract recreationists and tourists who spend money at the few businesses located at the lake, supporting the local economy. Further, recreation opportunities and aesthetics attract and retain residents, further supporting the local economy. Removal of Scott Dam and restoration of a natural flowing river would alter the recreational activities and aesthetics of the local area. While reservoir-based recreation would no longer be feasible at the Project site, restoration of the river would increase the availability of river-based recreation. The net effect on visitation, total visitor spending, and associated jobs and income supported in the area would likely be adverse at first during the early stages of restoration and as people adjust to new recreation opportunities. However, in the longer term, river-based recreation may provide similar economic opportunity such that effects may be negligible or even possibly beneficial. In sum, effects on economic opportunity at Scott Dam may be adverse particularly in the short-term (with potential magnitude of adverse effects similar to the effects described above under the construction phase) but could potentially be negligible or even beneficial due to river-based recreation opportunities and amenities.

Cape Horn Dam

There is currently limited economic activity in the Cape Horn Dam Area. While there is some recreation at Van Arsdale Reservoir, there is little recreation spending or associated employment and income due to the paucity of businesses in the area. Therefore, Cape Horn Dam removal is expected to have a negligible effect on economic opportunity in the Cape Horn Dam Area.

Eel River Watershed

The Eel River historically supported an active fishery, but this fishery has been adversely affected by dwindling stocks. If fish abundance in the Eel River were to improve in response to the Proposed Action and return to natural conditions, then economic opportunity associated with commercial and recreational fishing could also increase. The magnitude of this economic benefit would depend on fish abundance, the level of fish harvest, and the length of the recreational fishing season allowed by pertinent regulations.

Additionally, a return to natural flows would affect river-based recreation and aesthetics in the Eel River. One analysis estimated that decommissioning of the Project would extend the rafting and kayak season on the Eel River by approximately 6 weeks (Center for Environmental Economic Development 2002); this extended season and associated increased recreation expenditures in the region would likely enhance recreation-related employment and income in the watershed.

Russian River Watershed

Post-construction, there would be no inter-basin diversions of water from the Eel River to the East Branch Russian River. This would affect availability of water in the Russian River basin, including to agricultural users in PVID, in downstream reaches of the Russian River, and possibly to municipal and industrial water users in the Russian River basin. The effect on Russian River basin water users would depend on how management of Russian River water supplies adjusts to a lack of inter-basin transfers, including whether minimum instream flows and reservoir levels are adjusted.

Regarding agriculture, water abandoned by the Project that is diverted by the PVID in Mendocino County is used to grow pasture, hay, grains, pears, wine grapes, and other specialty crops (National Agricultural Statistics Service 2023). Farther downstream, the Russian River provides water supplies for additional cropland, primarily planted to high-value orchards and vineyards in Mendocino and Sonoma counties. Reductions in irrigation water supply in these agricultural areas may result in reduced agricultural production value and less economic opportunity.

Two recent economic analyses by Highland Economics (2020) and Economic Forensics and Analytics, Inc (2023) studied the potential impact on Sonoma and Mendocino counties' economies of Project inter-basin diversion of water ceasing. The Highland Economics (2020) 2020 analysis estimated that reductions in agricultural productivity due to reduced water supply[3] could result in approximately 100 fewer jobs being supported in Sonoma and Mendocino counties, with roughly half of the impact in each county (Highland Economics 2020). Similarly, the Economic Forensics and Analytics, Inc (2023) 2023 analysis focused on the Sonoma County economy estimated that a 10 percent water reduction supply (which the analysis indicated could be similar to the effects of cessation of Project inter-basin transfer of water) could result in 50 fewer agricultural jobs and a decrease of approximately $6.0 million in annual income in Sonoma County (Economic Forensics and Analytics, Inc. 2023). The Economic Forensics and Analytics, Inc (2023) study also estimated that cessation of inter-basin transfers could result in a 30 percent water supply reduction to agriculture, with three times the effect on jobs and income.

The effect of ceasing Project inter-basin transfers on Russian River basin municipal, commercial, and industrial water users is highly dependent on how water supply management would change with cessation of Project inter-basin transfers and also on hydrologic water year. Based on the Highland Economics (2020) study, if instream flows and reservoir levels were reduced in order to continue to meet water user demands in the face of less supply, it is possible that there would be little to no effect on these users (Highland Economics 2020). However, if water supplies to municipal and industrial users are reduced, water shortages or curtailments would impose costs on household, commercial, and industrial water users. The Highland Economics (2020) study identified that these costs could span such diverse categories as inconvenience, aesthetics (for example, brown lawns and unwashed cars), damaged or lost landscape plants, increased costs of

[3] This study analyzed two water supply management alternatives to cessation of Project inter-basin transfers. Most results are presented for a scenario that included reductions in both water supply and instream flows. The scenario assumed there would be: (1) a reduction in minimum instream flows (compared to baseline conditions); (2) a new Hydrologic Index based on Lake Mendocino inflow with modified thresholds compared to baseline conditions; and (3) annually varying reductions in water supply to municipal and agricultural water users.

alternative production practices or technology, or reduced economic activity by commercial and industrial users. Highland Economics (2020) and Economic Forensics and Analytics, Inc. (2023) estimated the economic cost to Sonoma County of reduced municipal, commercial, and industrial water supplies may range from approximately $300 to $3,000 per acre-foot, depending on the user and the severity of water shortage (Economic Forensics and Analytics, Inc. 2023; Highland Economics 2020).[4] For commercial users, the key economic sectors in Mendocino and Sonoma counties that are particularly reliant on water include utilities; manufacturing industries such as lumber/sawmills, wineries, and food processing; and tourism industries such as lodging and food service establishments (Highland Economics 2020). If elimination of Project inter-basin transfers resulted in a 10 percent reduction in municipal, commercial, and residential water supply in Sonoma County, then the Economic Forensics and Analytics, Inc. (2023) analysis estimated that the cost could be approximately 250 jobs and $60 million in reduced income across all sectors (Economic Forensics and Analytics, Inc. 2023).

Similarly, the Highland Economics (2020) study determined that water-based recreation and tourism-related economic activity in the Russian River basin may be affected by cessation of Project water transfers. Reduced flows and reservoir levels may adversely affect recreation quality and opportunity for boaters in the Russian River and for recreationists at Lake Mendocino (if Lake Mendocino management is modified). The effects on employment and income of these changes to recreation availability in the Russian River basin may be relatively low, or less than 20 jobs (Highland Economics 2020).

In summary, the Proposed Action (including the cessation of Project inter-basin transfer of water) would have an adverse effect on economic opportunity in the Russian River Watershed. However, if inter-basin transfers of water are continued (e.g., see Section 3.4.1.2) and/or if alternative water strategies can be achieved, this effect would be negligible.

Population and Housing Effects

Post-dam removal, there would be negligible direct effects on housing or population as there are only a few PG&E employees operating and maintaining Project facilities. However, there may be indirect effects on housing and population in some parts of the study area due to changes in economic opportunity, aesthetics, and recreation resources.

<u>Scott Dam Area</u>

In the Scott Dam Area, changes in recreation and aesthetics from dam removal may affect the attractiveness of the area for homeowners and recreationists, which may affect both population and housing demand.

---

4 The study estimated that eliminating Project inter-basin transfers would reduce income to commercial, municipal, and industrial users by approximately $58.9 million. Inter-basin transfers are approximately 62,500 acre-feet annually, of which the study estimated that 34.2 percent or approximately 21,375 acre-feet is used by commercial, municipal, and industrial users. Dividing $58.69 million by 21,375 provides an estimated $2,750 of income generated per acre-foot.

There may be potential effects on property values in the Scott Dam Area due to dam removal. The Proposed Action would affect different aspects of the community around Scott Dam and Lake Pillsbury, such as recreation, aesthetics, water quality, and community identity, which can, in turn, affect property values. For property owners, Lake Pillsbury is an amenity with a positive economic value. Economic studies of the effects of reservoir recreation and views on nearby housing prices indicate that effects vary substantially based on location, water body characteristics, and other factors. Some studies have found that up to approximately 20 percent of lakefront property value may be related to the aesthetic and recreation amenity of the lake (see for example, Dickes and Crouch 2015; Lansford and Jones 1995; Loomis and Feldman 2003). However, the area is remote with few properties with views of Lake Pillsbury.

Regarding the potential effects on these few properties, several studies have also analyzed the effects of dam removal on property value. For example, one study reviewed the effect of 75 dam removal projects in the New England region and found no statistical effect on property value (Guilfoos and Walsh 2023). Other studies have reported an increase in value following dam removal and restoration (i.e., Bohlen and Lewis 2009; Born *et al.* 1998; Kruse and Scholz 2006). Increases in value were generally related to improvements in water quality, removal of dam structures, and enhancement of the natural riparian environment. However, many of the dams in these studies created small impoundments, not large reservoirs such as Lake Pillsbury, so Proposed Action effects may be different from effects in the studies noted above.

One study that modeled the effects of the Klamath River dam removals (Kruse and Ahmann 2009) found that adjacency to Klamath Project reservoirs increased residential property values, all else equal. As noted in a review of potential property value effects of the Klamath Dam removals, there are several factors that make it challenging to predict the impacts of dam removal on property values, including local real estate market conditions and varying priorities and values held by current and prospective homeowners (such as for lakefront property versus proximity to a free-flowing river) (Snyder *et al.* 2012).

As dam removal would expose shorelines, another pertinent study at Almanor Lake in California found that increased exposure of shoreline lowers house prices between 0.2 percent and 1 percent for every additional foot of exposed shoreline (Loomis and Feldman 2003). However, proximity to rivers also tends to increase property values (Nicholls and Crompton 2017). Following dam removal and restoration actions, natural flows of the Eel River would be reestablished within the reservoir bed and downstream of the former Scott Dam site. Some property owners or potential property owners may prefer a natural flowing river over a reservoir, potentially limiting the effect on property values or even enhancing property values of some homes. The properties surrounding the reservoir would be more distant from the river than they are from the reservoir, and due to this distance and potential riparian vegetation restoration, the few properties that currently have reservoir views may not have a view of the river. For these reasons, the property value benefit of the restored river may be less than the property value benefit of the reservoir. In summary, some local property owners near Lake Pillsbury may experience a change in property values due to the change in aesthetics and recreation; this effect in the long-term may be adverse, negligible, or beneficial.

In sum, current residents and recreationists are drawn to the region for the recreational opportunities provided by Lake Pillsbury. In the initial years following dam removal, the net effect on population and housing values is likely to be adverse. Over the long term, residents and recreationists may be drawn to the region for the amenities provided by a free-flowing river. The net effect on population and housing values may be adverse or it may be beneficial. The effects of the Proposed Action are more likely to be less adverse or even possibly beneficial following restoration of the Lake Pillsbury lands.

Cape Horn Dam Area

In the Cape Horn Dam Area, only a few PG&E employees operate and maintain Project facilities. After dam removal, these employees would no longer be required to conduct work in the area. As such, effects on population and housing are expected to be negligible and not expected to affect economic opportunity (see above discussion) or other socioeconomic conditions at the level that would be required to cause population to change.

Eel River Watershed

In the Eel River Watershed, effects on population and housing are expected to be negligible as the Proposed Action is not expected to affect economic opportunity (see above discussion) or other socioeconomic conditions at the level that would be required to cause population to change.

Russian River Watershed

Population and associated housing demand in areas that are economically reliant on inter-basin transfers of water from the Project, such as within the PVID, could be affected due to reductions in economic opportunity and changes in community way of life.

In particular, economic opportunity and community way of life may be affected in the PVID, which uses Project inter-basin transfers of water. The population within the PVID is estimated at approximately 1,000 people (see Table 3.3.13-2). The lifestyle and economic opportunity of many of these residents may be affected by reductions in water availability, which could reduce population and housing demand in the area. However, people who reside in the PVID area have likely chosen that location not just because of access to irrigation water but also for many other reasons, such as enjoying a rural lifestyle, scenic views, and access to recreational amenities. In addition, alternative water management strategies may be put into place to address the reduction in water from the current diversion. As such, the effect on population and housing may be negligible to minor and adverse.

Due to the complexity of factors affecting population change, while it is possible that there could be localized adverse effects on population and housing (particularly in the PVID), the Proposed Action would likely have a negligible effect on population and housing throughout the Russian River Watershed.

Recreation Value

Changes in water management would affect value associated with water-based recreation opportunity to recreationists throughout the study area.

Scott Dam and Cape Horn Dam Areas

Currently, the reservoirs are attractions to recreationists visiting recreation sites at Lake Pillsbury and Van Arsdale Reservoir, as presented above. Removal of Scott Dam and restoration of a natural flowing river would alter the type and quality of recreational activities and aesthetics of the region. However, with restoration to a natural flowing river, river-based amenities and recreation may replace reservoir-based recreation as an attraction.

The effects on long-term recreation value to residents and visitors depends on several factors, including preferences and priorities, restoration and use of lands formerly inundated by the reservoirs, and the level of investments in river-based recreation facilities and opportunities. The type and nature of water-based activities would change, particularly boating activities. However, with restoration and investment in river-based recreation infrastructure, many land-based recreation activities would still be available but would potentially attract different people. As such, recreation value for some residents and visitors would likely decrease while recreation value would likely increase for others. Depending on the land management and future recreation infrastructure investments in the Project area, land-based recreation such as camping, picnicking, and hiking may continue, albeit with different scenic amenities. For recreationists who prefer lake-based activities, there are numerous other lakes, reservoirs, and camping areas in the region that can provide substitute recreation opportunities; for example, there are 24 other campgrounds in the Mendocino National Forest (U.S. Forest Service 2022). Lake Mendocino is approximately 17 miles from Lake Pillsbury, and Clear Lake is approximately 21 miles from Lake Pillsbury.

Immediately following construction, the effect of the Proposed Action on visitation and recreation value would likely be adverse as restoration would be in its early stages and as people would need to adjust to new recreation opportunities. Over the long term, river-based recreation and alternative lake and camping areas would provide value to recreationists in the area, particularly if there are investments in river-based recreation infrastructure and amenities. Potential adverse effects can be offset with restoration of vegetation and site aesthetics (see the Restoration Plan) and with investment in river-based recreation infrastructure by local businesses. In sum, due to the substantial change in recreation opportunity, the net effect on recreation value in the long term may be adverse, negligible, or beneficial following restoration.

Eel River Watershed

A new, natural flow regime along the Eel River may impact recreational opportunities. There may be a higher potential for flooding in wet seasons with no water control option afforded by the removed dam, but also potential for greater recreation value due to an extended boating season. One analysis estimated that decommissioning of the Project would extend the rafting and kayak season on the Eel River by approximately 6 weeks (Center for Environmental Economic Development 2002).

In addition, if the Proposed Action results in increased abundance of fish in the Eel River Watershed, then recreational fishing value would also be enhanced. Greater abundance of fish tends to enhance the quality of fishing and associated recreational value to anglers. Recreational value increases for each fishing trip taken, and more trips are typically taken to locations with high-quality fishing opportunities. While the magnitude of the benefit cannot be quantified, over the long term, the Proposed Action is expected to have a beneficial effect on recreational value to anglers in the Eel River Watershed.

In summary, the Proposed Action is expected to have a beneficial effect on recreational value to recreationists in the Eel River Watershed.

Russian River Watershed

Without the transfer of water from the Project, there may be reduced water levels at Lake Mendocino and reduced flows in the upper Russian River (from Coyote Valley Dam to Asti) during drier periods. Lower water levels can adversely affect recreation if facilities are no longer accessible, if flows are not adequate for boating, and/or if visual aesthetic quality (or other aspect of recreational quality) is reduced.

Canoeing and kayaking are popular recreational activities along the Russian River below Lake Mendocino, with commercially guided trips available (Sonoma Water 2016). Swimming and sunbathing are also popular recreational activities along the upper Russian River. Many of the pools in the Russian River below Lake Mendocino are relatively deep and are influenced by summer impoundments, so access to swimming and sunbathing would not be substantially altered or inhibited by changes in stream flows.

The upper Russian River section from Coyote Valley Dam to Asti receives less boat traffic than downstream sections of the Russian River (Sonoma Water 2016). Based on interviews with river guides and other sources in the region, the 2020 Highland Economics analysis of effects of Project inter-basin transfers estimated that there may be approximately 19,000 to 95,000 paddle days on the upper Russian River, of which approximately 75 percent could be adversely affected if changes in management result in reduction in upper Russian River flows below 70 cubic feet per second (cfs) during the boating season (Highland Economics 2020). Potential impacts to recreation in the 2020 Highland Economics analysis were modeled based on the percent of the summer recreation season (June through September) in which low water levels would adversely affect boating recreation access, defined as flows below 70 cfs as established in the Draft Environmental Impact Report for Fish Habitat Flows and Water Rights Project (Sonoma Water 2016). Reduced visitation (compared to current conditions flow levels with the Project in the summer months) was estimated in Highland Economics 2020 analysis at between 400 and 47,000 reduced boating trips annually, depending on water year type, management of Lake Mendocino in response to cessation of Project inter-basin transfers, and other factors (Highland Economics 2020). Using a conservative value of $30 per day for these reduced boating trips equates to reduced recreation value of $12,000 to $1.4 million annually. This reduction in recreation value associated with boating on the Russian River if flows decrease below the boating threshold could be partially offset by the expected increase in boating recreational value in the Eel River (i.e., reduced recreation value may be mitigated if recreationists can shift to the Eel River during times when there are lower flows in the Russian River).

Recreation value at Lake Mendocino in the Russian River Watershed may also be affected by the Proposed Action. Lake Mendocino is located approximately 5 miles northeast of Ukiah on the East Fork of the Russian River in Mendocino County (USACE 2024). It was created in 1958 by the construction of the Coyote Valley Dam for flood control. Lake Mendocino recreational facilities include 18 miles of trails, picnic areas, campgrounds, boat launches, swimming areas, and playgrounds across 14 recreation areas (USACE 2023). These facilities provide opportunities for boating, swimming, water skiing, fishing, camping, mountain biking, horseback riding, hiking, and sightseeing. Lake Mendocino recreation facilities are open year-round, but the summer months of June through August are the most popular months for boating activities on the reservoir (USACE 2018). Boating access is particularly affected by changes in water levels. There are two public boat ramps: one at the northern end of Lake Mendocino (North Boat Ramp) and one at the southern end of Lake Mendocino near Coyote Valley Dam (South Boat Ramp).

Data on visitation at Lake Mendocino for the years 2019, 2022, and 2023 is provided in Table 3.4.1.14-4. Data for 2020 and 2021 were not included as the visitation data were much lower than typical, likely due to the COVID-19 pandemic. On average over the three recent years, there were approximately 493,000 recreation visits (person-days), of which nearly 108,000 visitor days on average included boating (thus making it likely to be most affected by reduced water availability and possible boat ramp closures).

Table 3.4.1.14-4. Lake Mendocino annual recreation visitation: 2019, 2022, 2023.

Visitation	2019	2022	2023	Average	% of Visitors[1]
Total	480,535	427,468	571,477	493,160	100%
Boaters	73,261	107,990	141,993	107,748	22%
Swimmers	72,825	83,968	147,966	101,586	21%
Anglers	71,900	86,070	101,276	86,415	18%

Source: USACE 2019, 2022, 2023.

[1] Visitors can participate in more than one activity, so boaters may also be swimmers and/or anglers. As such, water-based visitation is less than the sum of boating, swimming, and angling participation.

The 2020 Highland Economics analysis of effects on recreation value at Lake Mendocino resulting from cessation of Project inter-basin transfers estimated that approximately 75 percent of Lake Mendocino recreation visitors could be adversely affected by reduced water levels (specifically water level drops below 722 feet mean surface level with all boat ramps closed or below 728 feet mean surface level with one boat ramp closed) and that the total number of visits to Lake Mendocino could drop by 7 percent to 25 percent, depending on the water year, changes in management of the reservoir in response to cessation of Project inter-basin transfers, and other factors (Highland Economics 2020). Based on 493,000 average annual visitors, this level of reduced visitation would equate to approximately 35,000 to 121,000 fewer visitors annually. Using a value of $30 per visitor day, this would equate to approximately $1.0 to $3.6 million in reduced recreation value from reduced visitation. Additionally, there could also be reduced visitation value to those who continue recreating at Lake Mendocino resulting from the reduced quality of recreation when there are reduced water levels.

In sum, the Proposed Action would likely be an adverse effect on recreation quality and quantity, with a consequent adverse effect on recreation value, at Lake Mendocino and in the Russian River Watershed due to reduced availability of water to maintain instream flows and reservoir levels important for recreation. The effects on value depend on the water year and the management of Lake Mendocino in response to cessation of inter-basin Project transfers (which in turn affect water levels) and how recreationists are affected by these changes. The magnitude of the effect would vary depending on management of Lake Mendocino and release of water for instream flows and water supply by the Bureau of Reclamation, water year (the drier the water year, the larger the adverse effect), and recreationist response to reduced water levels. However, based on prior analyses conducted by Highland Economics, a conservative estimate of the magnitude of reduced value to recreationists may be in the range of approximately $1 million to $5 million annually (Highland Economics 2020). If, on the other hand, inter-basin transfers of water are continued (see Section 3.4.1.2) and/or if alternative water strategies can be achieved, this effect would be negligible.

Community Way of Life

The change from a lacustrine to riverine environment and return to unimpaired flows in the Eel River and East Branch Russian River could affect a community's way of life in diverse ways. The Proposed Action could most greatly affect community character and way of life through changes in recreation, aesthetics, agricultural land use, and economic opportunity. These types of effects differ throughout the study area, as described below.

Scott Dam Area

Pillsbury Reservoir is valued by many local residents as a recreational and environmental amenity of their community (Lake Pillsbury Alliance n.d.), and its removal would change the community's way of life and the sense of place for residents. The environmental shift from a reservoir to a free-flowing river would shift economic activities, aesthetics, and recreation activities. In response to this shift, there may be closure of long-standing local businesses, as well as a shift in the local population. Current residents and visitors may choose to live and recreate in other areas, and new, different residents and recreationists may be attracted to the area. The community may thus also experience changes in demography and in community relationships. For many current residents and visitors, these types of shifts will likely be adverse, while for others the changes in way of life may be beneficial.

Cape Horn Dam Area

As there are few businesses or residences in the Cape Horn Dam Area, there are negligible effects of the Proposed Action expected on community way of life in this area.

Eel River Watershed

As described above, the Proposed Action would likely have beneficial effects on river-based recreation, aesthetics, and economic opportunity in the Eel River Watershed. As a result, community way of life and sense of place may be enhanced in the Eel River, particularly for residents who value water-based recreation opportunity and aquatic habitat and fisheries restoration.

Russian River Watershed

Way of life and community character may be adversely affected, particularly in the PVID, if ranches and farms are no longer viable or if farms have to significantly change operations, which could change the rural character of the area and the way of life of local ranchers and farmers. Reduced water supplies may result in changes in farm ownership, increased farm consolidation (small farms purchased by larger farms), or potential long-term fallowing of lands. Reduced agricultural production may result in reduced agricultural employment opportunities, which would adversely affect farmworkers and communities dependent on agricultural work. Elsewhere in the Russian River Watershed, community way of life and sense of place could be adversely affected by reduced recreation opportunity, reduced economic opportunity, and changes in residential water supply availability. In sum, the Proposed Action may have an adverse effect on quality of life in the Russian River Watershed. However, if inter-basin transfers of water are continued (see Section 3.4.1.2) and/or if alternative water strategies can be achieved, this effect would be negligible.

Local Government Stability and Fiscal Conditions

In the long term, Proposed Action effects on local government stability and fiscal conditions depend on how property values, economic activity, and government expenditures are expected to change. This varies throughout the study area.

Scott Dam Area

As described above, the Proposed Action would affect different aspects of the community around Scott Dam and Lake Pillsbury such as recreation, aesthetics, and community identity that can, in turn, affect property value and recreation economic activity.

In terms of the magnitude of the potential effect on local government revenues from changes in property values, there are approximately 300 recreational homes and cabins in four communities (Rice Forks, Lake Pillsbury Homesite Tract, Lake Pillsbury Ranch, and Westshore) surrounding Lake Pillsbury (U.S. Forest Service 2011). To approximately estimate the assessed value of these homes, the average assessed property value per housing unit in the county was calculated. Across Lake County, the total assessed value of all property in fiscal year 2022–2023 was $8.711 billion. Dividing by the estimated 34,385 housing units in the county (U.S. Census Bureau 2023) translates to approximately $253,000 in assessed value per housing unit across the entire county.[5] This value

[5] This value matches well with the market value of summer homes near Lake Pillsbury as viewed on several real estate websites. Since market value typically exceeds assessed value, and since the taxable value of many of these homes is just on the structure value and not the land value, using this average assessed value likely overestimates property taxes supported by homes near Lake Pillsbury.

includes land and housing improvements; the taxable value of much of the housing at Lake Pillsbury is just for the housing improvement as most of the land is owned by USFS and is not taxable. The property tax rate in Lake County varies from 1.0 to 1.112 percent (Herrington 2023) or up to approximately $285 annually per home. This indicates that county property taxes paid by the 300 homes in Lake County may be at most approximately $85,000 annually, or less than 0.1 percent of property tax collections (totaling over $101.3 million) in Lake County in fiscal year 2022–2023. Given that the total value of property taxes paid by homes in the Scott Dam Area is such a low portion of total tax revenues in Lake County, and that property taxes would still be paid with the Proposed Action (although they may be lower if property values decline), there is expected to be negligible effect on local government stability and fiscal conditions in Lake County.

If local flood damages to public infrastructure were to increase due to the removal of the dams and unregulated flows under the Proposed Action (see Section 3.4.1.2), then expenses to local governments could increase compared to the No-Action Alternative. With implementation of the measures identified in the land use analysis (see Section 3.4.1.9), these types of potential impacts would be negligible; therefore, effects of the Proposed Action on government expenditures are expected to be negligible.

Cape Horn Dam Area

There are negligible expected effects to local government stability and fiscal conditions in this area. There are little to no property value effects expected around Cape Horn Dam as there is little private property adjacent to the dam and Van Arsdale Reservoir. Further, there would be little to no change in economic activity in the area.

However, if local flood damages to public infrastructure were to increase due to the removal of the dams and unregulated flows under the Proposed Action (see Section 3.4.1.2), then expenses to local governments could increase compared to the No-Action Alternative. With implementation of the measures identified in the land use analysis (see Section 3.4.1.9), these types of potential impacts would be negligible, so effects of the Proposed Action on government expenditures are expected to be negligible.

Eel River Watershed

Effects of the Proposed Action on local government fiscal conditions in the Eel River Watershed are expected to be generally beneficial. As discussed above, increased flows in the Eel River Watershed and enhanced fish habitat and recreation conditions may all enhance property values and economic activity, which would tend to increase local government tax receipts.

However, if local flood damages to public infrastructure were to increase due to removal of the dams and unregulated flows under the Proposed Action (see Section 3.4.1.2), then expenses to local governments could increase compared to the No-Action Alternative. With implementation of the measures identified in the land use analysis (see Section 3.4.1.9), these types of potential impacts would be negligible; therefore, effects of the Proposed Action on government expenditures are expected to be negligible.

Russian River Watershed

With cessation of Project inter-basin transfer of water in the Proposed Action, economic activity in the Russian River basin is expected to decline, particularly in economic sectors that are high water users. This would then lead to declines in local government tax revenues from sales tax, property tax, and other taxes. For example, a 2023 study by Economic Forensics and Analytics, Inc of the potential effects of reduced Russian River flows on the Sonoma County economy estimated that the effects of reduced economic activity on all sources of local tax revenues could vary from approximately $2.5 million to $7.4 million, depending on the level of water loss (10 percent to 30 percent was analyzed in the study). Most of these tax impacts are from potential changes in economic activity in the commercial sector. These tax impacts would be much lower if commercial businesses adjust to changes in water supply (through water efficiency measures, new technology, or procurement of alternative water supplies) and thereby minimize the reduction in their output that would result from water shortages.

Property taxes are a particularly important source of income for local tax districts and county government. Property taxes may be affected by reduced water availability that leads to a decline in property values. Compared to the No-Action Alternative, local property values could decline throughout the upper Russian River Watershed, particularly in the PVID where water supplies would be most affected by cessation of Project inter-basin transfers.

The assessed value of agricultural land is based on soil class and irrigation availability, so property value (and associated property tax) can decline with reduced irrigation supplies. However, the effects of changes in farmland value on property taxes are mitigated due to the California Land Conservation Act of 1965 (usually referred to as the Williamson Act). This act enables local governments and private landowners to enter into agreements that restrict land to agricultural or open space use in return for a lower property tax assessment, with an average discount in Mendocino County of 10 percent to 95 percent (Mendocino County Board of Supervisors n.d.). Data from the California Department of Conservation indicate that much of the irrigated agricultural lands in the PVID and the upper reaches of the Russian River in Mendocino County are under Williamson Act contracts (California Department of Conservation 2022). Property taxes in Mendocino County average approximately 1 percent of assessed value.[6] Data on the average assessed value of farmland and how that value may change were not available to estimate the value of property tax reductions that could occur in Mendocino County. For Sonoma County, a 2023 economic analysis of reduced water availability to agriculture estimated that a 10 percent to 30 percent reduction (used by the report to represent conditions without Project inter-basin transfers) could result in reduced county tax revenues of $33,000 to $100,000 annually; most of this tax revenue reduction is likely due to reduced property taxes. This provides an indication of the magnitude of property value effects on agricultural lands that may be experienced in Mendocino County.

[6] Assessed value in the county in 2023 was $13.49 billion and total collected taxes were $117.3 million, according to the 2023 County of Mendocino Annual Comprehensive Financial Report (Office of the Auditor-Controller/Treasurer-Tax Collector 2024).

In sum, compared to the No-Action Alternative, if the Proposed Action results in cessation of inter-basin transfers of water, then there is an expected adverse effect on local government revenues in the Russian River Watershed. However, if inter-basin transfers of water are continued (Section 3.4.1.2) and/or if alternative water strategies can be achieved, this effect would be negligible.

Habitat and Species-Related Cultural and Economic Values

As described in Section 3.4.1.4, effects on habitat and aquatic species in the study area under the Proposed Action compared to the No-Action Alternative may be adverse in some areas and beneficial in others. The types of potential effects on socioeconomic values and the affected populations are the same as those described above for the construction phase. However, the magnitude of effects is different in both the Eel and Russian River watersheds in the long term, and the direction of effects is also different in the Eel River Watershed.

<u>Scott Dam and Cape Horn Dam Areas</u>

The types of potential effects on habitat and species-related cultural and economic values are the same as those described above for the construction phase.

<u>Eel River Watershed</u>

Long term, following restoration, the Proposed Action is expected to have beneficial effects on habitat and species and associated cultural and socioeconomic values to Tribes and other communities. Specifically, the Proposed Action is expected to have beneficial effects to habitat conditions for Pacific lamprey, salmon, steelhead, and tidewater goby, other native fish species, and freshwater mussels (see Section 3.4.1.4). Many of these species are valued by Tribes and other communities in the region, resulting in a beneficial effect on cultural and other socioeconomic values associated with these resources.

<u>Russian River Watershed</u>

Long term, the Proposed Action is expected to have some adverse effects on cultural value to Tribes and socioeconomic value to other communities that value conservation of Russian River habitat and aquatic species. Specifically, reduced inter-basin flows are expected to have adverse effects on some important fish species (see Section 3.4.1.4) valued by Tribes and other communities in the region for cultural, recreational, subsistence, commercial, and passive use. The importance and socioeconomic value of conserving and restoring these aquatic habitats and species for current and future generations can be quite high.

If inter-basin transfers cease, flows in the East Branch Russian River would be reduced, which would also have an adverse effect on existing aquatic habitat for special-status aquatic species, benthic macroinvertebrates, other common game and non-game fish species, and the stocked rainbow trout fishery (see Sections 3.4.1.4).

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam in the same year. There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam. This timing would affect the magnitude of economic activity and population and housing effects in any given construction year.

If the Scott Dam adit were removed and sediment flushed in a year prior to removal of Cape Horn Dam, mechanical removal of sediment behind Cape Horn Dam would be required and may extend the construction period somewhat, increasing the period over which economic activity and population/housing effects may be experienced. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice. Resulting hydrological and water quality changes may affect fish resources but are not expected to result in a measurable change to socioeconomics overall due to expected mitigation of effects on fisheries and other aquatic resources. See Section 3.4.1.4 for a discussion of effects to aquatic resources from the different dam removal sequencing options.

If Cape Horn Dam were removed the year prior to Scott Dam removal, then when Scott Dam is removed, sediment may bury or partially bury the newly constructed New Eel-Russian Facility (NERF) intake. Additional construction may be required to remove sediment at the NERF intake, and the duration of the construction period may be extended under this dam removal sequencing option, again extending the period over which economic activity and population/housing effects may be experienced.

In all dam removal sequencing options, effects to socioeconomic resources would occur, regardless of which dam is removed first. Although the length of the construction period may vary somewhat depending on the dam removal sequencing option, effects to socioeconomic resources are not expected to be substantially different as a similar number of workers and equipment would be used. As a result, there would be no measurable effects on the magnitude or direction of effects to socioeconomic resources from the sequencing options for the removal of Scott Dam and Cape Horn Dam.

Construction and Environmental Measures

To avoid or reduce effects to socioeconomic resources during construction, PG&E will obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Construction Site Water Diversion, Dewatering, and Drawdown Plan;
- Construction Aquatic Species Management and Monitoring Plan;
- Construction Water Quality and Water Temperature Monitoring Plan;
- Stormwater Pollution Prevention Plan;

- Construction Erosion Prevention Plan;
- Hazardous Materials Measures and BMPs;
- Spill Prevention, Control, and Countermeasures; and
- East Branch Russian River Diversion Plan.

To reduce potential effects to socioeconomic resources during the initial condition and preliminary restoration (Phase 2a) and resulting condition and restoration (Phase 2b), PG&E will implement the following environmental measures. A complete list of environmental measures is included in Section 2.2.3.

- Restoration Plan;
- Post-construction Road Restoration Plan.

Unavoidable Adverse Effects

With expected mitigation plans, there are no unavoidable adverse impacts on socioeconomic resources and values anticipated at Cape Horn Dam or in the Eel River Watershed. The removal of Scott Dam would result in a change from a lacustrine to riverine environment at Lake Pillsbury and a return to unimpaired Eel River flows that may result in changes in and could have unavoidable effects on recreation value, community way of life, and population and housing in the Scott Dam area. These effects may be offset by restoration.

In the Russian River Watershed, if inter-basin water transfers cease, then there would potentially be unavoidable adverse impacts on water reliability and cost, economic opportunity (particularly farming and ranching), recreation value in the Russian River Watershed, and community way of life. If actions can be taken to allow continued water diversions (see Section 3.4.1.2) or if alternative water sources can be found, there would likely be no unavoidable adverse effects to socioeconomic resources. However, if no such alternative water supply strategies were to occur, there would be unavoidable adverse effects to economic opportunity, recreation, and community way of life in the Russian River Watershed.

References

Bay Area Council Economic Institute. 2023. The economic benefits of removing the Potter Valley Project dams. Available at: https://www.bayareaeconomy.org/files/pdf/BACEI-PotterValley-Feb2023-FINAL.pdf.

Bohlen, C., and L.Y. Lewis. 2009. Examining the economic impacts of hydropower dams on property values using GIS. Journal of Environmental Management 90: S258–S269. DOI: 10.1016/j.jenvman.2008.07.026.

Born, S.M., K.D. Genskow, T.L. Filbert, N. Hernandez-Mora, M.L. Keefer, and K.A. White. 1998. Socioeconomic and institutional dimensions of dam removals: the Wisconsin experience. Environmental Management 22(3): 359–370. DOI: 10.1007/s002679900111.

California Department of Conservation. 2022. California Willamson Act Enrollment Finder. Available at: https://maps.conservation.ca.gov/dlrp/WilliamsonAct/.

California Department of Parks and Recreation. 2014. 2012 survey on public opinions and attitudes on outdoor recreation in California (SPOA) – online tool. Available at: https://parks.ca.gov/SPOA.

Center for Environmental Economic Development. 2002. A river in the balance: benefits and costs of restoring natural water flows to the Eel River. Available at: https://eelriver.org/wp-content/uploads/2024/03/EelEconReport2002-Executive-Summary.pdf.

Dickes, L., and E.L. Crouch. 2015. The impact of changing lake levels on property values: a hedonic model of Lake Thurmond. Review of Regional Studies 45(3). DOI: 10.52324/001c.8053.

Economic Forensics and Analytics, Inc. 2023. Economic impact of Potter Valley Project (PVP) and estimated effects on Sonoma County economy. Available at: https://sonomafb.org/wp-content/uploads/2023/12/PVP-Econ-Impacts.pdf.

Guilfoos, T., and J. Walsh. 2023. A hedonic study of New England dam removals. Ecological Economics 203: 107624. DOI: 10.1016/j.ecolecon.2022.107624.

Herrington, J. 2023. Annual comprehensive financial report: fiscal year ending June 30, 2023. Available at: https://www.lakecountyca.gov/DocumentCenter/View/9416/2023-County-of-Lake-ACFR.

Highland Economics. 2020. Economic value of Potter Valley Project to Mendocino and Sonoma counties. Prepared for Sonoma Water.

Humboldt County Department of Public Works. 2022. Water use estimates for Eel River groundwater basin. Available at: https://humboldtgov.org/DocumentCenter/View/102830/Water-Use-Technical-Memorandum.

Kruse, S.A., and J. Ahmann. 2009. The value of lake adjacency: a hedonic pricing analysis on the Klamath River, California. Ecotrust Working Paper Series 5. Ecotrust, Portland.

Kruse, S., and A. Scholz. 2006. Preliminary economic assessment of dam removal: the Klamath River. Ecotrust, Portland.

Lake Pillsbury Alliance. No date. Lake Pillsbury Alliance: our mission. Available at: https://www.savelakepillsbury.org/what-we-do.

Lansford, N.H., and L.L. Jones. 1995. Marginal price of lake recreation and aesthetics: an hedonic approach. Journal of Agricultural and Applied Economics 27(1): 212–223.

Loomis, J. and M. Feldman. 2003. Estimating the benefits of maintaining adequate lake levels to homeowners using the hedonic property method. Water Resources Research 39(9). DOI: 10.1029/2002WR001799.

Mendocino County Board of Supervisors. No Date. Response to Grand Jury Report Titled: The Williamson Acvt – What is it? Available at: https://www.co.mendocino.ca.us/bos/meetings/21816/21857/21868/22022/22137/Responses22137.pdf.

National Agricultural Statistics Service. 2023. CropScape data layer, map of Mendocino County. Available at: https://nassgeodata.gmu.edu/CropScape/.

Nicholls, S., and J.L. Crompton. 2017. The effect of rivers, streams, and canals on property values. River Research and Applications 33(9): 1,377–1,386. DOI: 10.1002/rra.3197.

Office of the Auditor-Controller/Treasurer-Tax Collector. 2024. 2023 County of Mendocino annual comprehensive financial report. Available at: mendocinocounty.gov/home/showpublisheddocument/65202/638545641954630000.

PG&E (Pacific Gas and Electric Company). 2017. Potter Valley Hydroelectric Project FERC Project No. 77. Available at: https://elibrary.ferc.gov/eLibrary/idmws/file_list.asp?document_id=14557327.

Rosenberger, R.S., E.M. White, J.D. Kline, and C. Cvitanovich. 2017. Recreation economic values for estimating outdoor recreation economic benefits from the National Forest System.

Snyder, R., D. Hansen, J. Bowen, and C. LaFlamme. 2012. Assessment of potential changes to real estate resulting from dam removal: Klamath secretarial determination regarding potential removal of the lower four dams on the Klamath River: DOI 2012. Available at: DOI_2012_0124_Assessment-of-Potential-Changes-to-Real-Estate-Resulting-from-Dam-Removal.pdf.

Sonoma Water. 2016. Fish habitat flows and water rights project draft environmental impact report. Available at: https://evogov.s3.amazonaws.com/185/media/165189.pdf.

Stillwater Sciences *et al.* 2021. Potter Valley Project feasibility study: capital improvements. Prepared by Stillwater Sciences and McBain Associates, Arcata, California; McBain Associates, Boise, Idaho; M.Cubed, Davis, California; Princeton Hydro, South Glastonbury, Connecticut; and Geosyntec Consultants, Oakland, California, for the Potter Valley Project planning agreement parties. Available at: https://www.twobasinsolution.org/wp/wp-content/uploads/Capital_Improvements_April_2021.pdf.

U.S. Census Bureau. 2023. Comparative housing characteristics. American Community Survey, ACS 1-year estimates comparison profiles, Table CP04. Available at: https://data.census.gov/table/ACSCP1Y2023.CP04?t=Housing Value and Purchase Price:Occupancy Characteristics&g=050XX00US06033_1400000US06033000100.

U.S. Census Bureau. 2020. Occupancy status. Decennial census, DEC redistricting data (PL 94-171), Table H1. Available at: https://data.census.gov/table/DECENNIALPL2020.H1?q=Ukiah city, California Housing&g=040XX00US06_160XX00US0681134.

U.S. Forest Service. 2011. Land stewardship proposal, Eel River Planning Unit.

U.S. Forest Service. 2022. Camping cabins. Available at: https://www.fs.usda.gov/activity/mendocino/recreation/camping-cabins/?recid=25120&actid=29

USACE (U.S. Army Corps of Engineers). 2024. Coyote Valley, Mendocino. Available at: https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Current-Projects/Coyote-Valley-Dam-Lake-Mendocino-CA-O-M-/.

USACE (U.S. Army Corps of Engineers). 2023. Value to the nation fast facts: USACE lake report: Coyote Valley Dam Lake Mendocino. USACE Institute for Water Resources. Available at: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/15427.

USACE (U.S. Army Corps of Engineers). 2022. Value to the nation fast facts: USACE lake report: Coyote Valley Dam Lake Mendocino. USACE Institute for Water Resources. Available at: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/15427.

USACE (U.S. Army Corps of Engineers). 2019. Value to the nation fast facts: USACE lake report: Coyote Valley Dam Lake Mendocino. USACE Institute for Water Resources. Available at: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/15427.

USACE (U.S. Army Corps of Engineers). 2018. Unit day values for recreation, fiscal year 2019. Available at: https://planning.erdc.dren.mil/toolbox/library/EGMs/EGM19-03.pdf.

TABLE OF CONTENTS

List of Acronyms

EJ	environmental justice
FERC	Federal Energy Regulatory Commission
mi.	mile
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
USEPA	U.S. Environmental Protection Agency

This Page Intentionally Left Blank

3.4.1.15 Environmental Justice

This section describes the potential effects related to environmental justice (EJ) that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of Project facilities to be decommissioned and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Refer to Section 3.4.1.1 for a description of each phase.

The effects are determined by analyzing the changes related to EJ that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Cape Horn Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) If the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam; and (2) If Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1). Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

Phase 1 of the Proposed Action includes removal of Scott Dam and all associated features, removal of portions of Cape Horn Dam and select associated features, and removal of all of the Project recreation facilities. The following potential effect related to EJ resulting from implementation of Phase 1 of the Proposed Action was evaluated:

- Potential impacts from Project construction/decommissioning activities that may disproportionately and adversely affect EJ communities identified in the study area.

Approach to Analysis

Consistent with guidance provided by the U.S. Environmental Protection Agency (USEPA), this analysis relies on demographic data from the U.S. Census Bureau to identify potential EJ communities using the "50 percent," "meaningfully greater," and "low-income" analysis methods (USEPA 2016). The approach to analysis is described in detail in Section 3.3.14. The discussion is organized by census tract within the study area, which is defined as the area within the Federal Energy Regulatory Commission (FERC) Project boundary and a 5-mile (mi.) buffer area beyond the FERC Project boundary. As shown on Map 3.3.14-1, the study area encompasses the entire Scott Dam and Cape Horn Dam areas and portions of the Eel River and Russian River watersheds. Therefore, to avoid redundancy, the following discussion is organized by the six census tract block groups that intersect the study area rather than by individual region.

Lake County, Tract 1, Block Group 2

Lake County, Tract 1, Block Group 2 overlaps Scott Dam, Lake Pillsbury, the surrounding recreation facilities (see Map 3.3.14-1), and the Eel River to the upper end of Van Arsdale Reservoir. The percentage of the minority population in the census block group included in the analysis was determined to be 35 percent (see Table 3.3.14-1). The census block group was not identified to be an EJ community using the "50 percent" analysis method, "meaningfully greater" analysis method, or the "low-income threshold criteria" method. Accordingly, implementation of Phase 1 of the Proposed Action would have no effect on EJ communities within Lake County, Tract 1, Block Group 2.

Mendocino County, Tract 101, Block Group 1

A small section of Mendocino County, Tract 101, Block Group 1 intersects the northernmost portion of the study area due north of Lake Pillsbury. The southwestern boundary of this census block group abuts the northeast side of the Eel River, outside of the study area (see Map 3.3.14-1). In addition, the rural community of Covelo and the Round Valley Reservation lie within this census block group, but outside of the study area, beyond the map extent.

Mendocino County, Tract 101, Block Group 1 was identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, and the "low-income threshold criteria" method. Although the block group was identified as an EJ community, direct Project construction effects would be geographically limited to the Scott Dam and Cape Horn Dam areas. No direct Project actions, such as construction and demolition work, would take place within Mendocino County, Tract 101, Block Group 1. Therefore, implementation of Phase 1 of the Proposed Action would have no effect on the EJ communities within Mendocino County, Tract 101, Block Group 1.

Mendocino County, Tract 106, Block Group 1

A small portion of Mendocino County, Tract 106, Block Group 1 intersects the northwest portion of the study area northwest of Cape Horn Dam and abuts the south side of the Eel River outside the study area (see Map 3.3.14-1). This census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method. Accordingly, implementation of Phase 1 of the Proposed Action would have no effect on EJ communities within Mendocino County, Tract 106, Block Group 1.

Mendocino County, Tract 108.01, Block Group 1

A portion of Mendocino County, Tract 108.01, Block Group 1 intersects the study area west of Cape Horn Dam and west of the East Branch Russian River (see Map 3.3.14-1). This census block group is located north of the city of Ukiah and does not include any incorporated cities or towns. Mendocino County, Tract 108.01, Block Group 1 was determined to meet the criteria as an EJ community using the “meaningfully greater” analysis method and the “low-income threshold criteria” method. However, direct Project construction effects would be geographically limited to the Scott Dam and Cape Horn Dam areas. No direct Project actions, such as construction and demolition work, would take place within Mendocino County, Tract 108.01, Block Group 1. Therefore, implementation of Phase 1 of the Proposed Action would have no effect on the EJ communities within Mendocino County, Tract 101, Block Group 1.

Mendocino County, Tract 108.02, Block Group 1

Mendocino County, Tract 108.02, Block Group 1 overlaps much of the Cape Horn Dam Area as well as portions of the Eel River downstream of Cape Horn Dam (see Map 3.3.14-1). The census block group was not identified to be an EJ community using the “50 percent” analysis method, the “meaningfully greater” analysis method, or the “low-income threshold criteria” method. Accordingly, implementation of Phase 1 of the Proposed Action would have no effect on EJ communities within Mendocino County, Tract 108.02, Block Group 1.

Mendocino County, Tract 108.02, Block Group 2

Mendocino County, Tract 108.02, Block Group 2 is bisected by the East Branch Russian River and includes the community of Potter Valley (see Map 3.3.14-1). The census block group was not identified to be an EJ community using the “50 percent” analysis method, the “meaningfully greater” analysis method, or the “low-income threshold criteria” method. Accordingly, implementation of Phase 1 of the Proposed Action would have no effect on EJ communities within Mendocino County, Tract 108.02, Block Group 2.

Phase 2: Post-facility Removal Effects

Phase 2 of the Proposed Action generally includes: (1) preliminary restoration activities, which would occur immediately following removal of the dams, recreation, and ancillary facilities; and (2) the resulting physical conditions. The following potential effects to EJ communities that could occur as a result of implementing Phase 2 of the Proposed Action were evaluated compared to the No-Action Alternative (existing condition):

- Potential impacts from Project post-facility removal and results that may disproportionately and adversely affect EJ communities identified in the study area.

Lake County, Tract 1, Block Group 2

As described above, there are no identified EJ communities within Lake County, Tract 1, Block Group 2. Therefore, implementation of Phase 2 of the Proposed Action would have no effect on EJ communities within Lake County, Tract 1, Block Group 2.

Mendocino County, Tract 101, Block Group 1

Mendocino County, Tract 101, Block Group 1 was determined to include minority or low-income populations and, therefore, was identified to be an EJ community. However, only a very small sliver of this block group intersects the study area, and there are no known developments or residences within this area. The largest town in this block group is Covelo, located northwest of Lake Pillsbury. The 58,600-acre Round Valley reservation is also located in this block group, at the confluence of the Eel River and North Fork of the Eel River. Both Covelo and the Round Valley Reservation are located well outside the study area boundary and are not expected to be disproportionately or adversely affected by any Phase 2 activities, as discussed further below.

Under Phase 2a of the Proposed Action, a large volume of sediment (approximately 12 million cubic yards) would be flushed downstream of the remnant reservoir into the Eel River. Most of this sediment would be initially deposited upstream of the Middle Fork Eel River, meaning associated impacts to water quality and fish would be primarily limited to the portion of the Eel River upstream of the Middle Fork Eel River. Covelo is not located on or near the Eel River and the Round Valley reservation is located at the North Fork Eel River confluence, well downstream of the Middle Fork Eel River confluence. Therefore, issues related to sediment flushing and associated impacts to water quality and aquatic species are not expected to disproportionately or adversely affect Covelo, the Round Valley reservation or any other EJ community in this census block.

Under Phase 2b of the Proposed Action, the Eel River would be restored to its natural condition. Most accumulated sediment would have flushed through the system, water quality would clear, and aquatic populations, including fish, would return. The fully restored river system would enhance conditions for fish species, including endemic species that are culturally important to the Round Valley tribe. The restored river would likely also attract anglers and other recreation visitors thereby creating new economic opportunities and activity for local EJ communities in this census block. Therefore, implementation of Phase 2b of the Proposed Action would ultimately benefit EJ communities within this census block group.

Mendocino County, Tract 106, Block Group 1

As noted previously, there are no identified EJ communities within Mendocino County, Tract 106, Block Group 1. Therefore, implementation of Phase 2 of the Proposed Action would have no effect on EJ communities within Mendocino County, Tract 106, Block Group 1.

Mendocino County, Tract 108.01, Block Group 1

Mendocino County, Tract 108.01, Block Group 1 intersects the study area. It includes minority and low-income populations and, therefore, was identified to be an EJ community.

Mendocino County, Tract 108.01, Block Group 1 is located north of the city of Ukiah and does not include any incorporated cities or towns. The nearest population centers are located adjacent to this census block group in Redwood Valley, which is situated just north of Lake Mendocino, along Highway 101, the primary travel corridor in the region. Redwood Valley is geographically separated from Potter Valley by a ridge. As such, the economies of the small communities located within Redwood Valley are likely tied to activity along the Highway 101 corridor and recreation at Lake Mendocino, not activity within Potter Valley.

Since there are no defined towns or communities in this census block group that are within or close to the study area, and people that reside within and/or near this census block group likely do not rely on activity along the East Branch Russian River for employment, implementation of Phase 2 of the Proposed Action is not expected to disproportionately and adversely affect EJ communities within Mendocino County, Tract 108.01, Block Group 1.

Mendocino County, Tract 108.02, Block Group 1

As described above, there are no identified EJ communities within Mendocino County, Tract 108.02, Block Group 1. Therefore, implementation of Phase 2 of the Proposed Action would have no effect on EJ communities within Mendocino County, Tract 108.02, Block Group 1.

Mendocino County, Tract 108.02, Block Group 2

As described above, there are no identified EJ communities within Mendocino County, Tract 108.02, Block Group 2. Therefore, implementation of Phase 2 of the Proposed Action would have no effect on EJ communities within Mendocino County, Tract 108.02, Block Group 2.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam the same year. There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam. If the Scott Dam adit were removed and sediment flushed in a year prior to removal of Cape Horn Dam, removal of sediment behind Cape Horn Dam would be required and may extend the construction period. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice. If Cape Horn Dam were removed in a year prior to the removal of Scott Dam, sediment would be released twice and could be diverted to the East Branch Russian River via the NERF diversion. Additionally, the construction period may be extended under this dam removal sequencing option.

In both options, direct effects from dam removal would occur within Lake County, Tract 1, Block Group 2, Mendocino County, Tract 108.02, Group 1, or Mendocino County, Tract 108.02, Group 2. As noted above, these census block groups do not include any identified EJ communities. As a result, there would be no measurable difference in potential effects related to EJ from the two alternate sequencing approaches to the removal of Scott Dam and Cape Horn Dam. Adverse effects are not expected to occur, regardless of which dam is removed first.

Construction and Environmental Measures

Implementation of the Proposed Action is not expected to result in disproportionate or adverse impacts to EJ communities in the study area or surrounding region. Therefore, construction and environmental measures are not necessary or proposed. Section 3.4.1.14 includes measures related to socioeconomic impacts. These measures would also benefit EJ communities.

Unavoidable Adverse Effects

Implementation of the Proposed Action would not result in unavoidable adverse effects to EJ communities.

References

U.S. Environmental Protection Agency. 2016. Promising practices for EJ methodologies in NEPA reviews. Available at: https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf. Accessed January 2024.

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Acronyms

CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CalEnviroScreen	California Environmental Screening Tool
CARB	California Air Resources Board
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CY	cubic yards
DPM	diesel particulate matter
ft.	feet
GHG	greenhouse gas
LCAQMD	Lake County Air Quality Management District
m	meters
mi.	miles
MCAQMD	Mendocino County Air Quality Management District
$MTCO_2e$	metric tons of carbon dioxide equivalent
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
Pb	lead
PG&E	Pacific Gas & Electric Company
PM	particulate matter
$PM_{2.5}$	particulate matter with a diameter of 2.5 microns or less
PM_{10}	particulate matter with a diameter of 10 microns or less
Project	Potter Valley Hydroelectric Project
ROG	reactive organic gases
SIP	State Implementation Plan
SO_2	sulfur dioxide

TAC	toxic air contaminant
TPY	tons per year
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

This Page Intentionally Left Blank

3.4.1.16 Air Quality

This section describes the potential effects to air quality that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Refer to Section 3.4.1 for a description of each phase.

The effects are determined by analyzing the changes in the air quality environment that may result from activities to be implemented under the Proposed Action compared to the No-action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Cape Horn Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing options for the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam; and (2) if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential effects to air quality resulting from the Project were evaluated:

- Potential air quality impacts caused by operation of off-road construction equipment (e.g., such as tractors, excavators, and cranes), including detonation of the adit plug, and on-road vehicles;
- Potential health risks or environmental justice concerns due to toxic air contaminant (TAC) emissions from off-road equipment and on-road vehicles; and
- Potential greenhouse gas (GHG) impacts caused by operation of off-road construction equipment and on-road vehicles.

The following section describes the approach used to determine air quality impacts associated with emissions from construction activities.

Approach to Analysis

Annual emissions in units of tons per year (TPY) were estimated for the following criteria pollutants:

- Oxides of nitrogen (NO_x)
- Ozone (O_3)[1]
- Sulfur dioxide (SO_2)
- Carbon monoxide (CO)
- Particulates ($PM_{2.5}$)
- Particulates (PM_{10})

In addition, annual emissions were estimated for GHG emissions in units of metric tons of carbon dioxide equivalent ($MTCO_2e$) per year.

Information regarding the construction activities at Scott Dam and Cape Horn Dam, including a finalized construction schedule, anticipated equipment use rates, and staffing numbers, is not available at this time. Therefore, this analysis represents a good-faith effort to evaluate Project impacts based on the conservative assumptions presented below.

General Conformity and* De Minimis *Thresholds

The 1990 Amendments to the Clean Air Act (CAA) require that federal agency activities conform to the State Implementation Plan (SIP) with respect to achieving and maintaining attainment of the National Ambient Air Quality Standards (NAAQS). The General Conformity Rule requires that a conformity analysis be performed, which demonstrates that a proposed project does not: (1) cause or contribute to violation of any NAAQS in the area; (2) interfere with provisions in the SIP for maintenance or attainment of any NAAQS; (3) increase the frequency or severity of any existing violation of any NAAQS; or (4) delay timely attainment of any NAAQS, any interim emission reduction goals, or other milestones included in the SIP. Provisions in the General Conformity Rule allow for exemptions from performing a conformity determination only if total emissions of individual nonattainment area pollutants resulting from a proposed project fall below the *de minimis* threshold value.

Table 3.4.1.16-1 details the *de minimis* thresholds for all criteria pollutants. A project would conform to the most recent United States Environmental Protection Agency (USEPA)–approved SIP if annual emissions do not exceed the threshold of 100 tons of NO_x, volatile organic compounds (VOCs) (modeled as ROG for the purposes of this analysis[2]), CO, PM_{10}, and/or $PM_{2.5}$. For the purpose of the analysis, impacts to air quality would be considered significant if emissions

[1] It is noted that the construction activities would emit O_3 precursors reactive organic gases (ROG) and NO_x. However, the Project would not directly emit O_3 since it is formed in the atmosphere during the photochemical reaction of O_3 precursors.

[2] Both ROG and VOC refer to a class of reactive/volatile organic compounds. The USEPA uses the term “VOC” in its regulations, and the California Air Resources Board (CARB) uses the term “ROG.” Differences between USEPA’s VOC definition and CARB’s ROG definition are generally limited to exempted constituents and do not affect this analysis.

from the Project would result in exceedances of the *de minimis* thresholds. If the *de minimis* thresholds are exceeded, then preparation of a General Conformity Analysis, pursuant to CAA Section 176(c)(4), would be required to determine whether the Project would interfere with attainment of the NAAQS.

Table 3.4.1.16-1. Federal *de minimis* thresholds.

Pollutant	Tons per Year
O_3 (ROG)	100
O_3 (NO_x)	100
CO	100
SO_2 (SO_x)	100
PM_{10}	100
$PM_{2.5}$	100
Lead (Pb)	25

Source: USEPA 2024b

Project emissions are also compared to local air district thresholds of significance, as applicable. The Scott Dam Area is located within the Lake County Air Quality Management District (LCAQMD), which does not have adopted thresholds of significance because the area is in attainment for all NAAQS and California Ambient Air Quality Standards (CAAQS). Therefore, emissions that would occur within the LCAQMD (i.e., decommissioning of Scott Dam) are compared to the federal *de minimis* thresholds only.

The Cape Horn Dam Area is located within the Mendocino County Air Quality Management District (MCAQMD); accordingly, emissions that would occur within the MCAQMD (i.e., decommissioning of Cape Horn Dam) are compared to the adopted MCAQMD thresholds of significance, as presented in Table 3.4.1.16-2.

Table 3.4.1.16-2. MCAQMD construction thresholds of significance.

Pollutant	Pounds per Day
ROG	54
NO_x	54
PM_{10} (exhaust)	82
$PM_{2.5}$ (exhaust)	54

Source: MCAQMD 2010

In addition, for Project activities that would occur within the MCAQMD (i.e., decommissioning of Cape Horn Dam), which is designated a nonattainment area for the state PM_{10} standard, Project consistency with the MCAQMD's Particulate Matter Attainment Plan is evaluated to determine whether implementation of the Project would hinder attainment of the PM_{10} CAAQS. See Section 3.3.15 for additional information related to the attainment status of Project study areas.

Emissions Estimate Methodology and Assumptions

Emissions associated with decommissioning Scott Dam and associated facilities were estimated using the California Emissions Estimator Model (CalEEMod) Version 2022.1.1.29, which is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and GHG emissions associated with both construction and operations from a variety of projects. CalEEMod was developed for the California Air Pollution Control Officers Association in collaboration with the California Air Districts. Default data (e.g., emission factors, trip lengths, meteorology, source inventory) have been provided by the various California Air Districts to account for local requirements and conditions. The model can be used for a variety of situations whereby an air quality analysis is necessary or desirable, such as preparing National Environmental Policy Act documents, conducting pre-project planning, verifying compliance with local air quality rules and regulations, etc.

The decommissioning activities for Scott Dam and associated facilities were assumed to occur in three seasons: (1) initial low-flow season (June–October), (2) first high-flow season (November–May), and (3) first low-flow season after sediment flushing (June–October). Recreation facility and features removal is planned to occur simultaneously with the dam removal activities. This is a conservative assumption considering that removal of recreation facilities may occur over multiple seasons concurrent with dam removal actions. Up to 100 workers per day were assumed to be on site during peak construction.

Table 3.4.1.16-3 presents the construction schedule applied in the emissions modeling. Construction may not occur for two years continuously; for example, the First High-Flow Season activities will occur during the first wet season following the initial low-flow season, which may not occur immediately after the initial low-flow season. Additionally, it is expected that construction would begin after the year 2026. However, should construction commence in years later than the modeled schedule, emissions are expected to be the same or fewer due to the increasingly stringent equipment and vehicle emissions standards.

Table 3.4.1.16-3. Decommissioning of Scott Dam – modeled construction schedule.

Construction Activity	Start Date[a]	End Date[a]	Days per Week	Workdays per Construction Activity
Initial Low-Flow Season Activities	06/01/2026	10/30/2026	5	110
First High-Flow Season Activities	11/01/2026	05/29/2027	5	150
First Low-Flow Season after Sediment Flushing	06/01/2027	10/30/2027	5	109
Recreation Facility Removal	6/01/2026	10/30/2027	5	151

Notes:
[a] Emissions modeling requires a year to estimate the appropriate emission factors so 2026 was used as a conservative year since emissions tend to be reduced over time.

Off-Road Emissions

Decommissioning would involve the use of heavy-duty off-road equipment such as tractors, excavators, and cranes. Off-road equipment types and the number of pieces of equipment were estimated based on similar dam removal projects and CalEEMod default values for demolition activities. The hours of use per day were conservatively set to 10 hours per day and assumed 5 days of work per week. Equipment horsepower and load factors were automatically populated with the default average values from CARB's OFFROAD2007 and OFFROAD2011 databases. Calendar year average emission factors for diesel, gasoline, and compressed natural gas off-road equipment are derived from CARB's OFFROAD2017 – ORION (v1.0.1) (CAPCOA 2022). See Table 3.4.1.16-4 for the assumptions for off-road equipment use.

Table 3.4.1.16-4. Decommissioning of Scott Dam – off-road equipment assumptions.

Construction Activity	Equipment Type	Fuel Type	Number per Day	Hours per Day	Horsepower	Load Factor
Initial Low-Flow Season Activities	Tractors/Loaders/Backhoes	Diesel	2	10	84	0.37
	Rubber-Tired Dozers	Diesel	2	10	367	0.4
	Concrete/Industrial Saws	Diesel	4	10	33	0.73
	Cranes	Diesel	4	10	367	0.29
	Other Construction Equipment	Diesel	4	10	82	0.42
First High-Flow Season Activities	Tractors/Loaders/Backhoes	Diesel	2	10	84	0.37
	Rubber-Tired Dozers	Diesel	2	10	367	0.4
	Concrete/Industrial Saws	Diesel	4	10	33	0.73
	Bore/Drill Rigs	Diesel	4	10	83	0.5
First Low-Flow Season after Sediment Flushing	Tractors/Loaders/Backhoes	Diesel	2	10	84	0.37
	Rubber-Tired Dozers	Diesel	2	10	367	0.4
	Concrete/Industrial Saws	Diesel	4	10	33	0.73
	Excavators	Diesel	2	10	36	0.38
	Bore/Drill Rigs	Diesel	2	10	83	0.5
	Cranes	Diesel	2	10	367	0.29
	Other Construction Equipment	Diesel	4	10	82	0.42
Recreation Facility Removal	Tractors/Loaders/Backhoes	Diesel	2	10	84	0.37
	Rubber-Tired Dozers	Diesel	2	10	367	0.4
	Concrete/Industrial Saws	Diesel	4	10	33	0.73

On-Road Emissions

On-road emissions include those associated with automobile use. This includes worker commutes and heavy truck trips to and from the Project Area. Vendor trip rates were left as CalEEMod default values for each construction season activity, and worker trip rates were scaled up to be conservative. During seasons that require substantial material export, the haul truck trip rates were calculated based on the assumption that each haul load can accommodate 16 cubic yards (CY) of material. During the initial low-flow season, 16,000 CY of material[3] was estimated to be exported from the site. During the first low-flow season after sediment flushing, an additional 92,000 CY of material[4] was estimated to be exported. The trip distances were updated based on the assumption that all vehicles would travel to and from the city of Ukiah, which is approximately 35 miles (mi.) away from the disturbance area. In addition, it was assumed that all exposed surfaces would be watered twice per day to reduce fugitive dust emissions. See Table 3.4.1.16-5 for the assumptions for automobile use.

Table 3.4.1.16-5. Decommissioning of Scott Dam – on-road vehicle assumptions.

Construction Activity	Trip Type	One-way Trips per Day[a]	Mi. per Trip	Vehicle Mi. Travelled per Construction Activity	Vehicle Mix
Initial Low-Flow Season Activities	Worker	200	35	2,800.0	LDA, LDT1, LDT2
	Hauling	18	35	1,272.7	HHDT
First High-Flow Season Activities	Worker	60	35	2,100.0	LDA, LDT1, LDT2
	Hauling	5	35	350.0	HHDT
First Low-Flow Season after Sediment Flushing	Worker	45	35	3,150.0	LDA, LDT1, LDT2
	Hauling	105	35	7,318.2	HHDT
Recreation Facility Removal	Worker	40	35	1,400.0	LDA, LDT1, LDT2
	Hauling	5	35	350.0	HHDT

[a] Values are rounded up to the nearest full number.

Key:
HHDT = heavy-heavy duty trucks in weight class 33,001-60,000 pounds
LDA = passenger cars
LDT1 = light-duty trucks in weight class 0-3,750 pounds.
LDT2 = light duty trucks in weight class 3,751-5,750 pounds.

Helicopter Emissions

Helicopters may be used to transport equipment and materials to and from the Project sites. It was assumed that a medium-lift utility helicopter powered by a double-turboshaft engine represents the type of aircraft that may be used. Emission factors for the aircraft per (1) landing and take-off cycle and (2) one hour of flight were derived from the *Guidance on the Determination of Helicopter Emissions* (Swiss Confederation 2015). Please see Appendix 3.4.1.16-A for additional details. The

3 As described in the Conceptual Decommissioning Plan. See Section 2.2.1.
4 As described in the Conceptual Decommissioning Plan. See Section 2.2.1.

one-way helicopter trip distance was assumed to be 35 mi., and it was assumed that 2 flights would occur per day for every day of construction, excluding recreation facility removal (369 days).

Criteria Pollutant and Fugitive Dust Emissions

Construction activities have the potential to temporarily affect air quality through emissions of criteria pollutants, including fugitive dust emissions. Impacts to air quality would result from engine exhaust and fugitive dust emissions caused by operation of off-road construction equipment, on-road vehicles, and helicopter use. As described previously, criteria air pollutants include O_3, CO, NO_2, SO_2, $PM_{2.5}$, PM_{10}, and Pb. Common sources of Pb emissions are from lead-based paint and leaded gasoline. Pb is not expected to be emitted during construction activities and, therefore, was not considered in this analysis. PM_{10} refers to all particulate matter less than 10 microns in diameter; thus, PM_{10} includes fugitive dust emissions.

Scott Dam Area

The Scott Dam Area is located in northern Lake County, which is within the jurisdiction of the LCAQMD. Lake County is in attainment for all NAAQS and CAAQS and, as a result, has not adopted an Air Quality Management Plan (LCAQMD 2024).

Emissions modeling for the decommissioning of Scott Dam was conducted using the assumptions described above. Table 3.4.1.16-6 summarizes the estimated construction emissions of criteria pollutants as compared to the corresponding federal thresholds.

Table 3.4.1.16-6. Decommissioning of Scott Dam – annual criteria pollutant and GHG emissions.

Construction Activity Season	Emissions (TPY)						
	ROG	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
Year 1: Initial Low-Flow Season Activities	0.43	3.46	4.94	0.01	32.14	3.50	977.00
Year 1: First High Flow Season Activities	0.10	0.85	1.16	0.00	3.76	0.40	188.92
Year 1: Recreational Facility Removal	0.29	2.48	2.91	0.00	9.16	1.00	492.81
Year 1: Helicopter Use	-	0.00	0.00	-	0.00	0.00	492.15
Year 1 Total	*0.82*	*6.80*	*9.01*	*0.01*	*45.07*	*4.91*	*2,150.88*
Year 2: First High Flow Season Activities	0.23	1.99	2.77	0.00	9.19	0.98	459.38
Year 2: First Low-Flow Season After Sediment Flushing	0.33	3.86	3.61	0.01	22.14	2.49	1,258.82
Year 2: Recreational Facility Removal	0.39	3.38	4.01	0.01	12.97	1.41	694.86
Year 2: Helicopter Use	-	0.00	0.00	-	0.01	0.01	718.32
Year 2 Total	*0.95*	*9.23*	*10.39*	*0.02*	*44.31*	*4.89*	*3,131.37*
Project Total	--	--	--	--	--	--	*5,282.26*
Federal *De Minimis* Threshold (TPY)	100	100	100	100	100	100	N/A
Exceeds Thresholds?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

As shown in the table, annual emissions during Project activities are well below the applicable thresholds for criteria pollutants.

Blasting would be used at Scott Dam during first high-flow season activities to remove the adit plug. Demolition blasting could result in the deposition of dust on surfaces and local elevated PM_{10} concentrations. Per the Institute of Air Quality Management's *Guidance on the Assessment of Dust from Demolition and Construction*, a detailed dust assessment should be conducted when receptors are located within 350 meters (m) (approximately 1,150 feet [ft.]) of the demolition site (Institute of Air Quality Management 2014). When receptors are located over 350 m from the demolition site, it can reasonably be concluded that dust-related impacts would not occur. Given that nearest receptor is more than 350 m from the adit (1,400 ft., or 426 m), dust deposition and PM emissions from blasting at Scott Dam are not anticipated to affect nearby receptors. Furthermore, implementation of PG&E's proposed General Construction Measures, which include fugitive dust reduction measures, would further minimize potential effects to receptors.

Immediately following the removal of Scott Dam, the water level at Lake Pillsbury would drop and expose silty soils which would then dry out. While the soils in the Lake Pillsbury reservoir bed dry and prior to revegetation efforts, there is a potential for windblown dust to affect surrounding areas. The prevailing wind direction in the Project area is most often from the northwest (Iowa State University 2024); as a result, dust from the reservoir bed is expected to primarily blow towards the southeast of Lake Pillsbury, which is sparsely populated. Other areas around Lake Pillsbury support scattered, rural residences. Fugitive dust from the drying reservoir bed is not expected to travel long distances due to the presence of dense vegetation surrounding the reservoir. These temporary windblown dust emissions would cease when vegetation establishes on the exposed reservoir bed and stabilizes the soils. Additional evaluation of potential impacts after removal of Scott Dam and restoration is provided below, and details about the proposed Restoration Plan are available in Section 2.2.

Overall, construction emissions would be temporary and intermittent and would cease upon completion of work. Emissions from equipment and vehicles would also be dispersed over a large area that is sparsely populated. PG&E will comply with all applicable LCAQMD rules and regulations regarding construction emissions including, but not limited to, Regulation 2 Rule 2, Particulate Matter Emissions, which establishes limits on the amount of PM allowed to be discharged from combustion (LCAQMD 2006). In addition, standard construction air quality control measures would be implemented during construction, including fugitive dust reduction measures and diesel emission reduction measures (see Section 2.2.3). Therefore, the environmental effects on air quality associated with construction activities implemented under the Proposed Action in the Scott Dam Area are considered negligible.

Cape Horn Dam Area

The Cape Horn Dam Area is located within Mendocino County, which is within the jurisdiction of the MCAQMD. This area is in attainment or unclassified for all NAAQS but is in nonattainment for the state PM_{10} standard. The MCAQMD has adopted a Particulate Matter Attainment Plan to achieve attainment of the PM_{10} CAAQS (MCAQMD 2005).

Similar to decommissioning of Scott Dam, information regarding the construction activities at Cape Horn Dam is not available at this time. A conservative approach was taken for evaluating potential emissions during construction at Cape Horn Dam by comparing potential emissions calculated for decommissioning Scott Dam to the MCAQMD criteria. It was assumed that emissions associated with the decommissioning of Cape Horn Dam would be less than those calculated for Scott Dam. Cape Horn Dam decommissioning would occur during the first low-flow season and the first high-flow season. No decommissioning activities are anticipated following first high-flow season, and so emissions associated with "First Low-Flow Season After Sediment Flushing" were omitted. Decommissioning of Scott Dam would require a higher volume of material export, resulting in more haul truck trips, and a longer construction period than decommissioning of Cape Horn Dam due to its larger size. Therefore, air quality emissions associated with the removal of Cape Horn Dam would be fewer than those associated with the removal of Scott Dam.

Emissions associated with decommissioning Cape Horn Dam would be fewer than those presented in Table 3.4.1.16-6. As shown in the table, all criteria pollutant emissions would be below the federal *de minimis* levels that are applied as the thresholds of significance for this analysis. In addition, Table 3.4.1.16-7 below presents the estimated daily emissions from decommissioning of Scott Dam in comparison to the MCAQMD's thresholds of significance.

Table 3.4.1.16-7. Decommissioning of Cape Horn Dam[a] – daily criteria pollutant emissions.

Year	Emissions (pounds/day)			
	ROG	**NO_x**	**PM_{10} (exhaust)**	**$PM_{2.5}$ (exhaust)**
Year 1: Initial Low-Flow Season Activities	2.37	18.98	0.73	0.67
Year 1: First High-Flow Season Activities	0.53	4.63	0.16	0.15
Year 1: Recreation Facility Removal	1.58	13.61	0.50	0.46
Year 1: Helicopter Use	0.00	0.04	0.06	0.06
Year 1 Max[b]	*4.48*	*37.27*	*1.45*	*1.34*
Year 2: First High-Flow Season Activities	1.24	10.88	0.36	0.33
Year 2: Recreation Facility Removal	2.15	18.53	0.66	0.61
Year 2: Helicopter Use	0.00	0.03	0.06	0.06
Year 2 Max[b]	*3.40*	*29.44*	*1.08*	*1.00*
MCAQMD Threshold of Significance	54	54	82	54
Exceeds Threshold?	**No**	**No**	**No**	**No**

[a] Calculations presented in this table are for Scott Dam. Air quality emissions associated with the removal of Cape Horn Dam would be fewer than those associated with the removal of Scott Dam.
[b] The MCAQMD thresholds of significance are in units of pounds per day and, therefore, this analysis sums emissions that may overlap. Year 1 maximum daily emissions are the sum of emissions from Initial Low-Flow Season Activities, Recreation Facility Removal, and Helicopter Use. Year 2 maximum daily emissions are the sum of emissions from First High-Flow Season Activities, Recreation Facility Removal, and Helicopter Use.

Because Mendocino County is designated a nonattainment area for PM_{10}, the Cape Horn Dam analysis also considers Project consistency with the MCAQMD's Attainment Plan. The MCAQMD's Attainment Plan notes that the primary sources of PM emissions in the county are from wildfire, residential wood burning, unpaved roads, and construction activities. The Attainment Plan includes several recommended control measures to reduce PM emissions, such as limiting the installation of wood stoves in new construction and supporting projects to pave existing unpaved roadways. As part of the Proposed Action, standard construction air quality control measures would be implemented during construction, including fugitive dust reduction measures and general emission reduction measures (see Section 2.2.3). Given the compliance with the standard construction air quality control measures, the Project would be consistent with all the applicable control measures, including prioritizing paved roadways for vehicle travel when feasible and compliance with grading regulations. Furthermore, it is noted that blasting, which can be a notable source of PM_{10} emissions, would not be required at Cape Horn Dam. Therefore, the proposed activities in the Cape Horn Dam Area would not hinder or delay attainment of the PM_{10} CAAQS.

Based on the discussion above and with implementation of the standard construction air quality control measures (see Section 2.2.3), the environmental effects on air quality associated with construction activities implemented under the Proposed Action in the Cape Horn Dam Area are considered negligible.

Eel River Watershed and Russian River Watershed

Off-road equipment would only be used within the Scott Dam and Cape Horn Dam areas, and therefore, would not generate emissions in the greater Eel River Watershed and Russian River Watershed.

The truck haul route is assumed to generally transport materials from Scott Dam, along Forest Route 20N past the Cape Horn Dam Area, along Eel River Road, through the community of Potter Valley along Potter Valley Road, westbound along State Route 20, southbound on US 101, and terminating in the city of Ukiah. It is acknowledged that other truck routes may be taken. The increase in haul truck traffic would result in emissions distributed along the haul route. Similarly, the use of helicopters may result in emissions along the flight path. However, the incremental increase in emissions due to haul truck traffic and helicopter use would not substantially affect air quality in the air districts located within the Eel River Watershed and Russian River Watershed. Furthermore, the hauling period and/or use of helicopters would be limited to Project decommissioning. Overall, the environmental effects on air quality associated with construction activities implemented under the Proposed Action in the Eel River Watershed and Russian River Watershed are considered negligible.

Potential Health Effects and Environmental Justice

TACs are air pollutants that may cause or contribute to an increase in mortality or serious illness or which may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air, but due to their high toxicity, they may pose a threat to public health even at very low concentrations. The primary TAC that construction activities may emit is diesel particulate matter (DPM), which was identified as a TAC by CARB in August 1998. DPM is typically composed of carbon particles and numerous organic compounds, including more than 40 known cancer-causing organic substances. Diesel exhaust also contains gaseous pollutants, including ROG and NO_X.

Some land uses are considered to accommodate populations that are more sensitive to air pollution than others. Sensitive population groups include children, the elderly, the acutely ill, and the chronically ill, especially those with cardiovascular diseases. Examples of sensitive receptor locations include hospitals, residences, convalescent facilities, and schools.

Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and Russian River Watershed

In the Scott Dam Area, the nearest residence to the demolition area is located approximately 1,400 ft. southwest of Scott Dam. In the Cape Horn Dam Area, the nearest residence to the demolition area is located approximately 1,000 ft. east of Cape Horn Dam. According to CARB, the concentration of DPM declines dramatically after 500 ft. of separation from the source (CARB 2005). Off-road equipment use associated with decommissioning activities would not occur within 500 ft. of receptors, and therefore, receptors would not be exposed to substantial diesel emission exhaust or other TACs associated with the use of off-road equipment.

Diesel-fueled haul trucks would operate on area roadways and emit DPM in closer proximity to receptors along the haul routes. However, given the transient nature of passing haul trucks and that vehicles currently use these roadways, construction emissions are not expected to adversely affect sensitive receptors.

The California Environmental Protection Agency has identified that many communities across the state are subjected to a disproportionate burden of pollution based on proximity to nearby sources, exposure to polluted air and/or water, and regional topographic features that affect the spread of pollutants, among other variables. Some of these communities experience the additional burden of socioeconomic stressors and health conditions that render them more vulnerable to the impacts of pollution. The Office of Environmental Health Hazard Assessment (OEHHA) has developed the California Environmental Screening Tool (CalEnviroScreen), which estimates cumulative impacts associated with both pollution exposure as well as socioeconomic factors in order to identify communities in which environmental justice concerns are prevalent (OEHHA 2021). The tool considers several metrics and establishes a CalEnviroScreen score for each census tract in the state and assigns an associated percentile to determine each census tract's score compared to the remainder of the state. For example, a percentile ranking of 99 would indicate that 99 percent of the census tracts in the state have better conditions. According to the OEHHA's CalEnviroScreen 4.0, the Scott Dam Area and Cape Horn Dam Area are located within census tracts with a CalEnviroScreen 4.0 percentile of 35 and 29, respectively (OEHHA 2024). This means that 35 and 29 percent, respectively, of census tracts in the state have lower values, and it can be reasonably concluded that residents located in the Project Area are not subjected to a disproportionate burden of pollution. Refer to Section 3.4.1.15, Environmental Justice, for further discussion of environmental justice.

Based on the above, the emissions generated from Project construction activities would not result in an increased health impact to the communities and would not result in a disproportionate pollution burden to the existing community.

Greenhouse Gas Emissions

Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and Russian River Watershed

GHG emissions would be generated during construction activities from the combustion of petroleum fuels to power on-road vehicles, off-road equipment, and helicopters. As summarized in Table 3.4.1.16-6, the decommissioning of Scott Dam would generate a total of 5,282.26 $MTCO_2e$. The decommissioning of Cape Horn Dam is expected to result in fewer emissions due to the smaller volume of required material export and shorter construction period. Nevertheless, under the conservative assumption that both components emit an equivalent volume of GHG emissions, the Proposed Action would generate a total of 10,564.52 $MTCO_2e$.

The federal government requires mandatory reporting of GHG emissions when projects may emit more than 25,000 $MTCO_2e$ in a year. The Proposed Action emissions would be well below this metric. A quantitative threshold for determining a project's significance has not been established at the state or federal level. Nevertheless, consistent with other recent Federal Energy Regulatory Commission environmental analyses[5] and to provide context, this analysis discloses the GHG emissions associated with the Proposed Action in comparison to state and national GHG emission inventories. In 2021, GHG emissions in the state of California totaled 381.3 million $MTCO_2e$ (CARB 2023). In that same year, net GHG emissions in the United States totaled 5,586 million $MTCO_2e$ (USEPA 2024a). In comparison to the state and national GHG emission inventories, total GHG emissions from the Proposed Action would constitute a maximum of 0.0028 and 0.0002 percent of total inventoried emissions, respectively. As another way to provide context, USEPA estimates than an average passenger vehicle emits roughly 4.6 $MTCO_2e$/year (USEPA 2024c). As a result, total GHG emissions from the Proposed Action would be the equivalent of 2,297 passenger cars driven for one year. While GHG emissions and global climate change are inherently cumulative impacts, the incremental contribution of Project construction emissions in the context of statewide and national emissions is negligible.

Phase 2: Post-facility Removal Effects

The following initial temporary condition and preliminary restoration (Phase 2a) and resulting physical conditions and restoration (Phase 2b) potential effects to air quality resulting from physical changes that may occur following removal of the dams and recreation facilities/ancillary facilities (Phase 2) compared to the No-action Alternative (existing condition) were evaluated:

- Potential effects of restoration and resulting effects on air quality.

To evaluate the long-term, post-facility removal effects, activities were qualitatively evaluated to determine whether there would be more, less, or no change in expected air quality and GHG emissions under the Proposed Action as compared to the No-action Alternative.

[5] See Section 3.3.11, Air Quality and Climate Change, of the Final Environmental Impact Statements for Hydropower License for the Goldendale Energy Storage Project – FERC Project No. 14861-002. Available online at: https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240208-3036. Accessed October 2024.

Criteria Pollutant, Fugitive Dust, and GHG Emissions

Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and Russian River Watershed

Under existing conditions, regular maintenance occurs as well as flow gage checks and vegetation management in the Scott Dam and Cape Horn Dam areas. Following facility removal, emissions may be generated from employee commutes to the sites until license termination. Heavy equipment may be used in the implementation of measures in the Restoration and Sediment/Channel Monitoring and Response plans, such as for grading and slope stabilization. Therefore, any emissions associated with post-facility removal would be substantially fewer than those that would occur during construction and are presented in Tables 3.4.1.16-6 and 3.4.1.16-7, both of which are under all applicable thresholds of significance. Therefore, following the proposed removal of Scott Dam and Cape Horn Dam and associated facilities, air quality effects and GHG emissions associated with restoration activities and the resulting effects would be minimal. After PG&E has met the requirements in the Surrender Order and the license is terminated, there will be no emissions resulting from operation and maintenance of the Project. As a result, negligible effects related to air quality would occur from the decommissioning and environmental measures are not proposed.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam the same year. Under this scenario, sediment would be flushed through the system and downstream the Eel River within the same season. In this case, the criteria pollutant emissions from initial low-flow season activities would occur within the same year. As presented in Table 3.4.1.16-6, if the emissions from initial low-flow season activities were doubled to represent activities occurring at both Scott Dam and Cape Horn Dam, the total annual emissions would still fall under the federal de minimis thresholds for all applicable pollutants.

There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam.

If the Scott Dam adit were removed and sediment flushed in a year prior to removal of Cape Horn Dam, mechanical removal of sediment behind Cape Horn Dam would be required and may extend the construction period. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice.

If Cape Horn Dam was removed in a year prior Scott Dam, when Scott Dam is removed, sediment may bury or partially bury the newly constructed NERF intake. Additional construction may be required to remove sediment at the NERF intake, and sediment could be diverted to the East Branch Russian River via the NERF diversion. The duration of the construction period may be extended under this dam removal sequencing option due to the additional construction required to remove sediment.

In both alternate dam removal sequencing options, air pollutants and GHGs would be emitted due to the use of off-road equipment and on-road vehicle trips, regardless of which dam is removed first. Although the length of the construction period may vary depending on the dam removal sequencing option, emissions are not expected to exceed the annual federal or daily local thresholds because construction would not be substantially different under each option. As a result, there would be no measurable difference in potential air quality impacts from the sequencing options for the removal of Scott Dam and Cape Horn Dam.

Construction and Environmental Measures

To avoid or reduce effects to air quality during construction and restoration activities, PG&E would obtain, prepare, and/or implement the following. A complete list of construction measures is included in Section 2.2.3.

- General Construction Measures, including implementation of emission reduction measures and fugitive dust reduction measures

Unavoidable Adverse Effects

There are no unavoidable adverse air quality effects from the Proposed Action.

References

CAPCOA (California Air Pollution Control Officers Association). 2022. California Emissions Estimator Model User Guide Version 2022.1. Available online at: https://caleemod.com/documents/user-guide/01_User%20Guide.pdf. Accessed October 2024.

CARB (California Air Resources Board). 2005. *Air Quality and Land Use Handbook: A Community Health Perspective*. Available online at: https://ww2.arb.ca.gov/sites/default/files/2023-05/Land%20Use%20Handbook_0.pdf. Accessed October 2024.

CARB (California Air Resources Board). 2023. *California Greenhouse Gas Emissions from 2000 to 2021: Trends of Emissions and Other Indicators*. Available online at: https://ww2.arb.ca.gov/sites/default/files/2023-12/2000_2021_ghg_inventory_trends.pdf. Accessed October 2024.

Institute of Air Quality Management. 2014. *Guidance on the Assessment of Dust from Demolition and Construction*, Version 1.1. Available online at: https://www.the-ies.org/sites/default/files/reports/construction-dust-2014.pdf. Accessed November 2024.

Iowa State University. 2024. Iowa Environmental Mesonet, Windrose Plot for [UKI] Ukiah. Available online at: https://mesonet.agron.iastate.edu/sites/windrose.phtml?station=UKI&network=CA_ASOS. Accessed November 2024.

LCAQMD (Lake County Air Quality Management District). 2006. Lake County Air Quality Management District Rules and Regulations. Available online at: https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID1549.pdf. Accessed October 2024.

LCAQMD (Lake County Air Quality Management District). 2024. "Quality of Air Affects Quality of Life." Available at: https://www.lcaqmd.net/about/. Accessed October 2024.

MCAQMD (Mendocino County Air Quality Management District). 2005. Particulate Matter Attainment Plan. Available at: https://www.co.mendocino.ca.us/aqmd/pdf_files/Attainment%20Plan_DRAFT.pdf. Accessed October 2024.

MCAQMD (Mendocino County Air Quality Management District. 2010. Adopted Air Quality CEQA Thresholds of Significance. Available at: https://www.co.mendocino.ca.us/aqmd/pdf_files/MCAQMDCEQARecomendations.pdf. Accessed October 2024.

OEHHA (Office of Environmental Health Hazard Assessment). 2021. CalEnviroScreen 4.0. Available online at: https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf. Accessed October 2024.

OEHHA (Office of Environmental Health Hazard Assessment). 2024. CalEnviroScreen from OEHHA. Available online at: https://experience.arcgis.com/experience/11d2f52282a54ceebcac7428e6184203/page/CalEnviroScreen-4_0/. Accessed October 2024.

Swiss Confederation. 2015. *Guidance on the Determination of Helicopter Emissions*.

USEPA (United States Environmental Protection Agency). 2024a. "Sources of GHG Emissions." Available online at: https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions. Accessed October 2024.

USEPA (United States Environmental Protection Agency). 2024b. General Conformity, *De Minimis* Tables. Available online at: https://www.epa.gov/general-conformity/de-minimis-tables. Accessed October 2024.

USEPA (United States Environmental Protection Agency). 2024c. "Greenhouse Gas Emissions from a Typical Passenger Vehicle." Available online at: https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle. Accessed November 2024.

This Page Intentionally Left Blank

Appendix 3.4.1.16-A

Air Quality Modeling Results and Calculations

This Page Intentionally Left Blank

Helicopter Emissions Calculations

Criteria Pollutant Emission Factors

Equipment	Cruising Speed (knots)	Propulsion Type	Engine Name	Fuel Type	Shaft HP	LTO Emissions						One Hour Emissions					
						Fuel (kg)	Nox (g)	HC (g)	CO (g)	PM non volatile (g)	PM number	Fuel (kg)	Nox (g)	HC (g)	CO (g)	PM non volatile (g)	PM number
Black Hawk/Sikorsky UH-60	140	Turboshaft Engine (double)	T700-GE-700	JET FUEL	1622	73	575.3	571	724.9	16.9	4.4976E+16	507.6	5.43	1.11	1.32	15	2.74E+18

Notes/Sources

Cruising speed from model-specific spec sheet (Sikorsky 2006)

Emission Factors: Swiss Confederation. December 2015. Guidance on the Determination of Helicopter Emissions.

GHG Emission Factors

	kg CO2 per gallons	g CH4 per gallon	GWP CH4	g N2O per gallon	GWP N2O
Kerosene-Type Jet Fuel	9.75	0.41	25	0.08	298

Source: https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf

Year/Equipment	Days of Use	Hours of Use per Day	Annual Hours of Operation	LTO Assumption (cycles per day)	Fuel (kg)	NOx (g)	HC (g)	CO (g)	PM non volatile (g)	Fuel (gallons)	CO2 (g)	CH4 (g)	N2O (g)	CO2e (g)
2026 - Black Hawk/Sikorsky UH-60	150	2	300	2	152,426	2,780	1,475	1,846	4,534	50,300.58	490,430,655.00	20,623.24	4,024.05	492,145,401.77
				Annual Emissions (tons)		0.00	0.00	0.00	0.00	--	490.43	0.02	0.00	492.15
				Annual Emissions (lbs)		5.56	2.95	3.69	9.07					
				Average Daily Emissions (lbs)		0.04	0.02	0.02	0.06					
2027 - Black Hawk/Sikorsky UH-60	219	2	438	2	222,475	3,529	1,628	2,028	6,604	73,416.68	715,812,669.00	30,100.84	5,873.33	718,315,443.76
				Annual Emissions (tons)		0.00	0.00	0.00	0.01	--	715.81	0.03	0.01	718.32
				Annual Emissions (lbs)		7.06	3.26	4.06	13.21					
				Average Daily Emissions (lbs)		0.03	0.01	0.02	0.06					

	Days of Construction
2026	150
2027	219
	369

TPY

	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e
2026 Initial Low-Flow Season Activities	0.43	3.46	4.94	0.01	32.14	3.50	977.00
2026 first high flow	0.10	0.85	1.16	0.00	3.76	0.40	188.92
2026 rec facility removal	0.29	2.48	2.91	0.00	9.16	1.00	492.81
2026 helicopter use	-	0.00	0.00	-	0.00	0.00	492.15
2026 total	*0.82*	*6.80*	*9.01*	*0.01*	*45.07*	*4.91*	*2,150.88*
2027 first high flow	0.23	1.99	2.77	0.00	9.19	0.98	459.38
2027 First Low-Flow Season after Sediment Flushin	0.33	3.86	3.61	0.01	22.14	2.49	1,258.82
2027 Recreation Facility Removal	0.39	3.38	4.01	0.01	12.97	1.41	694.86
2027 helicopter use	-	0.00	0.00	-	0.01	0.01	718.32
2027 total	*0.95*	*9.23*	*10.39*	*0.02*	*44.31*	*4.89*	*3,131.37*

5282.26

10564.51675 2296.634077 cars

0.0028%

0.00019%

Year	Emissions (pounds/day)			
	ROG	NO_x	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Initial Low-Flow Season Activities	2.37	18.98	0.73	0.67
First High-Flow Season Activities	0.53	4.63	0.16	0.15
Recreation Facility Removal	1.58	13.61	0.50	0.46
Helicopter Use	0.00	0.04	0.06	0.06
Year 1 Max	*4.48*	*37.27*	*1.45*	*1.34*
First High-Flow Season Activities	1.24	10.88	0.36	0.33
Recreation Facility Removal	2.15	18.53	0.66	0.61
Helicopter Use	0.00	0.03	0.06	0.06
Year 2 Max	*3.40*	*29.44*	*1.08*	*1.00*
MCAQMD Threshold of Significance	54	54	82	54
Exceeds Threshold?	**No**	**No**	**No**	**No**

PV - First High Flow Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	PV - First High Flow
Construction Start Date	11/1/2026
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	1.70
Precipitation (days)	56.2
Location	39.408983456493644, -122.96488312478226
County	Lake
City	Unincorporated
Air District	Lake County AQMD
Air Basin	Lake County
TAZ	244
EDFZ	2
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.29

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Industrial	1.00	User Defined Unit	1.00	1.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	5.12	4.29	37.2	54.0	0.08	1.24	202	204	1.14	20.4	21.6	—	9,539	9,539	0.36	0.21	7.28	9,617
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	5.29	4.44	38.7	54.2	0.08	1.35	202	204	1.24	20.4	21.7	—	9,540	9,540	0.36	0.21	0.20	9,611
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.47	1.24	10.9	15.2	0.02	0.36	50.0	50.4	0.33	5.05	5.38	—	2,753	2,753	0.11	0.06	0.92	2,775
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.27	0.23	1.99	2.77	< 0.005	0.07	9.12	9.19	0.06	0.92	0.98	—	456	456	0.02	0.01	0.15	459

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	5.12	4.29	37.2	54.0	0.08	1.24	202	204	1.14	20.4	21.6	—	9,539	9,539	0.36	0.21	7.28	9,617

Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	5.29	4.44	38.7	54.2	0.08	1.35	202	204	1.24	20.4	21.7	—	9,540	9,540	0.36	0.21	0.20	9,611
2027	5.08	4.29	37.2	53.0	0.08	1.24	202	204	1.14	20.4	21.6	—	9,496	9,496	0.36	0.21	0.19	9,567
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.63	0.53	4.63	6.35	0.01	0.16	20.5	20.6	0.15	2.07	2.21	—	1,132	1,132	0.04	0.02	0.40	1,141
2027	1.47	1.24	10.9	15.2	0.02	0.36	50.0	50.4	0.33	5.05	5.38	—	2,753	2,753	0.11	0.06	0.92	2,775
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.11	0.10	0.85	1.16	< 0.005	0.03	3.74	3.76	0.03	0.38	0.40	—	187	187	0.01	< 0.005	0.07	189
2027	0.27	0.23	1.99	2.77	< 0.005	0.07	9.12	9.19	0.06	0.92	0.98	—	456	456	0.02	0.01	0.15	459

3. Construction Emissions Details

3.1. First High-Flow Season Activities (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	4.64	3.88	36.9	43.5	0.07	1.33	—	1.33	1.23	—	1.23	—	7,315	7,315	0.30	0.06	—	7,340
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.55	0.46	4.41	5.19	0.01	0.16	—	0.16	0.15	—	0.15	—	873	873	0.04	0.01	—	876
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.10	0.08	0.80	0.95	< 0.005	0.03	—	0.03	0.03	—	0.03	—	145	145	0.01	< 0.005	—	145
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.64	0.54	0.80	10.6	0.00	0.00	187	187	0.00	18.8	18.8	—	1,605	1,605	0.06	0.05	0.17	1,622
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.94	0.09	0.01	0.01	15.6	15.6	0.01	1.58	1.60	—	620	620	< 0.005	0.10	0.03	649
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.06	0.11	1.15	0.00	0.00	18.9	18.9	0.00	1.91	1.91	—	185	185	0.01	0.01	0.34	187
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	< 0.005	< 0.005	0.12	0.01	< 0.005	< 0.005	1.58	1.58	< 0.005	0.16	0.16	—	74.0	74.0	< 0.005	0.01	0.06	77.6
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.02	0.21	0.00	0.00	3.45	3.45	0.00	0.35	0.35	—	30.6	30.6	< 0.005	< 0.005	0.06	31.0
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.02	< 0.005	< 0.005	< 0.005	0.29	0.29	< 0.005	0.03	0.03	—	12.3	12.3	< 0.005	< 0.005	0.01	12.8

3.3. First High-Flow Season Activities (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	4.49	3.76	35.6	43.1	0.07	1.23	—	1.23	1.13	—	1.13	—	7,311	7,311	0.30	0.06	—	7,336
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	4.49	3.76	35.6	43.1	0.07	1.23	—	1.23	1.13	—	1.13	—	7,311	7,311	0.30	0.06	—	7,336
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Roa Equipment	1.31	1.10	10.4	12.6	0.02	0.36	—	0.36	0.33	—	0.33	—	2,132	2,132	0.09	0.02	—	2,139
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.24	0.20	1.89	2.29	< 0.005	0.07	—	0.07	0.06	—	0.06	—	353	353	0.01	< 0.005	—	354
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.62	0.52	0.71	10.8	0.00	0.00	187	187	0.00	18.8	18.8	—	1,619	1,619	0.06	0.05	6.26	1,642
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.90	0.08	< 0.005	0.01	15.6	15.6	0.01	1.58	1.60	—	609	609	< 0.005	0.10	1.03	640
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.58	0.52	0.71	9.81	0.00	0.00	187	187	0.00	18.8	18.8	—	1,576	1,576	0.06	0.05	0.16	1,593
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.91	0.09	< 0.005	0.01	15.6	15.6	0.01	1.58	1.60	—	610	610	< 0.005	0.10	0.03	639
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.16	0.14	0.23	2.58	0.00	0.00	46.1	46.1	0.00	4.66	4.66	—	444	444	0.02	0.02	0.79	449
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.27	0.02	< 0.005	< 0.005	3.86	3.86	< 0.005	0.39	0.40	—	178	178	< 0.005	0.03	0.13	186

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.04	0.47	0.00	0.00	8.42	8.42	0.00	0.85	0.85	—	73.5	73.5	< 0.005	< 0.005	0.13	74.4
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.05	< 0.005	< 0.005	< 0.005	0.70	0.70	< 0.005	0.07	0.07	—	29.4	29.4	< 0.005	< 0.005	0.02	30.9

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Remove	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
First High-Flow Season Activities	Demolition	11/1/2026	5/29/2027	5.00	150	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
First High-Flow Season Activities	Tractors/Loaders/Backhoes	Diesel	Average	2.00	10.0	84.0	0.37
First High-Flow Season Activities	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40

First High-Flow Season Activities	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73
First High-Flow Season Activities	Bore/Drill Rigs	Diesel	Average	4.00	10.0	83.0	0.50

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
First High-Flow Season Activities	—	—	—	—
First High-Flow Season Activities	Worker	60.0	35.0	LDA,LDT1,LDT2
First High-Flow Season Activities	Vendor	—	35.0	HHDT,MHDT
First High-Flow Season Activities	Hauling	5.00	35.0	HHDT
First High-Flow Season Activities	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Control Strategies Applied	PM10 Reduction	PM2.5 Reduction
Apply dust suppressants to unpaved roads	84%	84%
Limit vehicle speeds on unpaved roads to 25 mph	44%	44%

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
First High-Flow Season Activities	0.00	0.00	0.00	—	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
User Defined Industrial	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2026	0.00	204	0.03	< 0.005
2027	0.00	204	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	18.5	annual days of extreme heat
Extreme Precipitation	22.6	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	44.1	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	24.9
AQ-PM	0.41
AQ-DPM	2.92
Drinking Water	5.42
Lead Risk Housing	47.3
Pesticides	59.8
Toxic Releases	0.00
Traffic	0.82
Effect Indicators	—
CleanUp Sites	74.9
Groundwater	71.1
Haz Waste Facilities/Generators	3.64
Impaired Water Bodies	51.2
Solid Waste	86.5
Sensitive Population	—
Asthma	66.0
Cardio-vascular	46.6
Low Birth Weights	16.2
Socioeconomic Factor Indicators	—

Education	47.5
Housing	47.6
Linguistic	13.3
Poverty	66.9
Unemployment	94.5

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	19.83831644
Employed	2.425253433
Median HI	7.86603362
Education	—
Bachelor's or higher	26.78044399
High school enrollment	100
Preschool enrollment	21.59630438
Transportation	—
Auto Access	51.48209932
Active commuting	56.26844604
Social	—
2-parent households	9.264724753
Voting	51.17413063
Neighborhood	—
Alcohol availability	78.59617606
Park access	29.16720133
Retail density	2.412421404
Supermarket access	19.96663673

Tree canopy	93.12203259
Housing	—
Homeownership	63.41588605
Housing habitability	49.87809573
Low-inc homeowner severe housing cost burden	40.43372257
Low-inc renter severe housing cost burden	16.47632491
Uncrowded housing	58.74502759
Health Outcomes	—
Insured adults	18.06749647
Arthritis	0.0
Asthma ER Admissions	66.9
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	8.8
Cognitively Disabled	21.0
Physically Disabled	1.4
Heart Attack ER Admissions	60.3
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	63.8
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—

Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	20.7
SLR Inundation Area	0.0
Children	77.6
Elderly	12.0
English Speaking	92.2
Foreign-born	4.2
Outdoor Workers	10.9
Climate Change Adaptive Capacity	—
Impervious Surface Cover	96.8
Traffic Density	0.5
Traffic Access	0.0
Other Indices	—
Hardship	74.7
Other Decision Support	—
2016 Voting	44.9

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	35.0
Healthy Places Index Score for Project Location (b)	17.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Land use adjusted
Construction: Construction Phases	phasing adjusted per project plan
Construction: Off-Road Equipment	Equipment types adjusted per PD and similar projects. Hours of use conservatively set to 10 hpd.
Construction: Dust From Material Movement	Material export reflects dam removal materials.
Construction: Trips and VMT	Trip lengths set to 35 mi to estimate trips to Ukiah. Additional haul trips added during phases 2 and 4.
Construction: On-Road Fugitive Dust	% pave adjusted to reflect haul routes.

PV - First Low-Flow After Sediment Flushing Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	PV - First Low-Flow After Sediment Flushing
Construction Start Date	6/1/2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	1.70
Precipitation (days)	56.2
Location	39.408983456493644, -122.96488312478226
County	Lake
City	Unincorporated
Air District	Lake County AQMD
Air Basin	Lake County
TAZ	244
EDFZ	2
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.29

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Industrial	1.00	User Defined Unit	1.00	1.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

Sector	#	Measure Title
Construction	C-10-B	Water Active Demolition Sites

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	7.26	6.05	70.1	67.7	0.19	2.20	476	478	2.05	50.8	52.9	—	24,858	24,858	0.49	2.18	26.3	25,548
Mit.	7.26	6.05	70.1	67.7	0.19	2.20	476	478	2.05	50.8	52.9	—	24,858	24,858	0.49	2.18	26.3	25,548
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	7.22	6.04	70.3	67.0	0.19	2.20	476	478	2.05	50.8	52.9	—	24,828	24,828	0.49	2.18	0.68	25,492
Mit.	7.22	6.04	70.3	67.0	0.19	2.20	476	478	2.05	50.8	52.9	—	24,828	24,828	0.49	2.18	0.68	25,492
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.15	1.80	21.2	19.8	0.06	0.66	121	121	0.61	13.0	13.7	—	7,402	7,402	0.15	0.65	3.40	7,603
Mit.	2.15	1.80	21.2	19.8	0.06	0.66	121	121	0.61	13.0	13.7	—	7,402	7,402	0.15	0.65	3.40	7,603
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.39	0.33	3.86	3.61	0.01	0.12	22.0	22.1	0.11	2.38	2.49	—	1,225	1,225	0.02	0.11	0.56	1,259
Mit.	0.39	0.33	3.86	3.61	0.01	0.12	22.0	22.1	0.11	2.38	2.49	—	1,225	1,225	0.02	0.11	0.56	1,259
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	7.26	6.05	70.1	67.7	0.19	2.20	476	478	2.05	50.8	52.9	—	24,858	24,858	0.49	2.18	26.3	25,548
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	7.22	6.04	70.3	67.0	0.19	2.20	476	478	2.05	50.8	52.9	—	24,828	24,828	0.49	2.18	0.68	25,492
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	2.15	1.80	21.2	19.8	0.06	0.66	121	121	0.61	13.0	13.7	—	7,402	7,402	0.15	0.65	3.40	7,603
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.39	0.33	3.86	3.61	0.01	0.12	22.0	22.1	0.11	2.38	2.49	—	1,225	1,225	0.02	0.11	0.56	1,259

2.3. Construction Emissions by Year, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	7.26	6.05	70.1	67.7	0.19	2.20	476	478	2.05	50.8	52.9	—	24,858	24,858	0.49	2.18	26.3	25,548

Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	7.22	6.04	70.3	67.0	0.19	2.20	476	478	2.05	50.8	52.9	—	24,828	24,828	0.49	2.18	0.68	25,492
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	2.15	1.80	21.2	19.8	0.06	0.66	121	121	0.61	13.0	13.7	—	7,402	7,402	0.15	0.65	3.40	7,603
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.39	0.33	3.86	3.61	0.01	0.12	22.0	22.1	0.11	2.38	2.49	—	1,225	1,225	0.02	0.11	0.56	1,259

3. Construction Emissions Details

3.1. First Low-Flow Season After Sediment Flushing (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	6.48	5.43	50.5	57.8	0.10	1.96	—	1.96	1.80	—	1.80	—	10,783	10,783	0.44	0.09	—	10,820
Dust From Material Movement	—	—	—	—	—	—	6.40	6.40	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	6.48	5.43	50.5	57.8	0.10	1.96	—	1.96	1.80	—	1.80	—	10,783	10,783	0.44	0.09	—	10,820
Dust From Material Movement	—	—	—	—	—	—	6.40	6.40	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.94	1.62	15.1	17.3	0.03	0.59	—	0.59	0.54	—	0.54	—	3,220	3,220	0.13	0.03	—	3,231
Dust From Material Movement	—	—	—	—	—	—	1.91	1.91	—	0.98	0.98	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.35	0.30	2.75	3.15	0.01	0.11	—	0.11	0.10	—	0.10	—	533	533	0.02	< 0.005	—	535
Dust From Material Movement	—	—	—	—	—	—	0.35	0.35	—	0.18	0.18	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.46	0.39	0.53	8.11	0.00	0.00	140	140	0.00	14.1	14.1	—	1,214	1,214	0.05	0.04	4.69	1,231
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.31	0.23	19.1	1.78	0.08	0.24	329	330	0.24	33.4	33.7	—	12,861	12,861	< 0.005	2.06	21.7	13,496
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.43	0.39	0.53	7.36	0.00	0.00	140	140	0.00	14.1	14.1	—	1,182	1,182	0.05	0.04	0.12	1,195
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.31	0.22	19.2	1.81	0.08	0.24	329	330	0.24	33.4	33.7	—	12,863	12,863	< 0.005	2.06	0.56	13,477
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.11	0.18	1.98	0.00	0.00	35.4	35.4	0.00	3.58	3.58	—	341	341	0.01	0.01	0.60	345
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.09	0.07	5.90	0.54	0.03	0.07	83.3	83.4	0.07	8.48	8.56	—	3,841	3,841	< 0.005	0.61	2.79	4,027
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.03	0.36	0.00	0.00	6.47	6.47	0.00	0.65	0.65	—	56.4	56.4	< 0.005	< 0.005	0.10	57.2
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.02	0.01	1.08	0.10	< 0.005	0.01	15.2	15.2	0.01	1.55	1.56	—	636	636	< 0.005	0.10	0.46	667

3.2. First Low-Flow Season After Sediment Flushing (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road	6.48	5.43	50.5	57.8	0.10	1.96	—	1.96	1.80	—	1.80	—	10,783	10,783	0.44	0.09	—	10,820
Dust From Material Movement	—	—	—	—	—	—	6.40	6.40	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	6.48	5.43	50.5	57.8	0.10	1.96	—	1.96	1.80	—	1.80	—	10,783	10,783	0.44	0.09	—	10,820
Dust From Material Movement	—	—	—	—	—	—	6.40	6.40	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.94	1.62	15.1	17.3	0.03	0.59	—	0.59	0.54	—	0.54	—	3,220	3,220	0.13	0.03	—	3,231
Dust From Material Movement	—	—	—	—	—	—	1.91	1.91	—	0.98	0.98	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.35	0.30	2.75	3.15	0.01	0.11	—	0.11	0.10	—	0.10	—	533	533	0.02	< 0.005	—	535
Dust From Material Movement	—	—	—	—	—	—	0.35	0.35	—	0.18	0.18	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.46	0.39	0.53	8.11	0.00	0.00	140	140	0.00	14.1	14.1	—	1,214	1,214	0.05	0.04	4.69	1,231
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.31	0.23	19.1	1.78	0.08	0.24	329	330	0.24	33.4	33.7	—	12,861	12,861	< 0.005	2.06	21.7	13,496
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.43	0.39	0.53	7.36	0.00	0.00	140	140	0.00	14.1	14.1	—	1,182	1,182	0.05	0.04	0.12	1,195
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.31	0.22	19.2	1.81	0.08	0.24	329	330	0.24	33.4	33.7	—	12,863	12,863	< 0.005	2.06	0.56	13,477
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.11	0.18	1.98	0.00	0.00	35.4	35.4	0.00	3.58	3.58	—	341	341	0.01	0.01	0.60	345
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.09	0.07	5.90	0.54	0.03	0.07	83.3	83.4	0.07	8.48	8.56	—	3,841	3,841	< 0.005	0.61	2.79	4,027
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.02	0.02	0.03	0.36	0.00	0.00	6.47	6.47	0.00	0.65	0.65	—	56.4	56.4	< 0.005	< 0.005	0.10	57.2
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.02	0.01	1.08	0.10	< 0.005	0.01	15.2	15.2	0.01	1.55	1.56	—	636	636	< 0.005	0.10	0.46	667

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
First Low-Flow Season After Sediment Flushing	Demolition	6/1/2027	10/30/2027	5.00	109	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

First Low-Flow Season After Sediment Flushing	Tractors/Loaders/Back	Diesel	Average	2.00	10.0	84.0	0.37
First Low-Flow Season After Sediment Flushing	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40
First Low-Flow Season After Sediment Flushing	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73
First Low-Flow Season After Sediment Flushing	Excavators	Diesel	Average	2.00	10.0	36.0	0.38
First Low-Flow Season After Sediment Flushing	Bore/Drill Rigs	Diesel	Average	2.00	10.0	83.0	0.50
First Low-Flow Season After Sediment Flushing	Cranes	Diesel	Average	2.00	10.0	367	0.29
First Low-Flow Season After Sediment Flushing	Other Construction Equipment	Diesel	Average	4.00	10.0	82.0	0.42

5.2.2. Mitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
First Low-Flow Season After Sediment Flushing	Tractors/Loaders/Backhoes	Diesel	Average	2.00	10.0	84.0	0.37
First Low-Flow Season After Sediment Flushing	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40
First Low-Flow Season After Sediment Flushing	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73
First Low-Flow Season After Sediment Flushing	Excavators	Diesel	Average	2.00	10.0	36.0	0.38

First Low-Flow Season After Sediment Flushing	Bore/Drill Rigs	Diesel	Average	2.00	10.0	83.0	0.50
First Low-Flow Season After Sediment Flushing	Cranes	Diesel	Average	2.00	10.0	367	0.29
First Low-Flow Season After Sediment Flushing	Other Construction Equipment	Diesel	Average	4.00	10.0	82.0	0.42

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
First Low-Flow Season After Sediment Flushing	—	—	—	—
First Low-Flow Season After Sediment Flushing	Worker	45.0	35.0	LDA,LDT1,LDT2
First Low-Flow Season After Sediment Flushing	Vendor	—	35.0	HHDT,MHDT
First Low-Flow Season After Sediment Flushing	Hauling	106	35.0	HHDT
First Low-Flow Season After Sediment Flushing	Onsite truck	—	—	HHDT

5.3.2. Mitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
First Low-Flow Season After Sediment Flushing	—	—	—	—
First Low-Flow Season After Sediment Flushing	Worker	45.0	35.0	LDA,LDT1,LDT2
First Low-Flow Season After Sediment Flushing	Vendor	—	35.0	HHDT,MHDT

First Low-Flow Season After Sediment Flushing	Hauling	106	35.0	HHDT
First Low-Flow Season After Sediment Flushing	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Control Strategies Applied	PM10 Reduction	PM2.5 Reduction
Apply dust suppressants to unpaved roads	84%	84%
Limit vehicle speeds on unpaved roads to 25 mph	44%	44%

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
First Low-Flow Season After Sediment Flushing	—	92,000	82.5	—	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
User Defined Industrial	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2027	0.00	204	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

5.18.2.2. Mitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	18.5	annual days of extreme heat
Extreme Precipitation	22.6	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	44.1	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	24.9
AQ-PM	0.41
AQ-DPM	2.92
Drinking Water	5.42
Lead Risk Housing	47.3
Pesticides	59.8
Toxic Releases	0.00
Traffic	0.82
Effect Indicators	—
CleanUp Sites	74.9
Groundwater	71.1
Haz Waste Facilities/Generators	3.64
Impaired Water Bodies	51.2
Solid Waste	86.5
Sensitive Population	—
Asthma	66.0
Cardio-vascular	46.6
Low Birth Weights	16.2
Socioeconomic Factor Indicators	—

Education	47.5
Housing	47.6
Linguistic	13.3
Poverty	66.9
Unemployment	94.5

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	19.83831644
Employed	2.425253433
Median HI	7.86603362
Education	—
Bachelor's or higher	26.78044399
High school enrollment	100
Preschool enrollment	21.59630438
Transportation	—
Auto Access	51.48209932
Active commuting	56.26844604
Social	—
2-parent households	9.264724753
Voting	51.17413063
Neighborhood	—
Alcohol availability	78.59617606
Park access	29.16720133
Retail density	2.412421404
Supermarket access	19.96663673

Tree canopy	93.12203259
Housing	—
Homeownership	63.41588605
Housing habitability	49.87809573
Low-inc homeowner severe housing cost burden	40.43372257
Low-inc renter severe housing cost burden	16.47632491
Uncrowded housing	58.74502759
Health Outcomes	—
Insured adults	18.06749647
Arthritis	0.0
Asthma ER Admissions	66.9
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	8.8
Cognitively Disabled	21.0
Physically Disabled	1.4
Heart Attack ER Admissions	60.3
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	63.8
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—

Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	20.7
SLR Inundation Area	0.0
Children	77.6
Elderly	12.0
English Speaking	92.2
Foreign-born	4.2
Outdoor Workers	10.9
Climate Change Adaptive Capacity	—
Impervious Surface Cover	96.8
Traffic Density	0.5
Traffic Access	0.0
Other Indices	—
Hardship	74.7
Other Decision Support	—
2016 Voting	44.9

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	35.0
Healthy Places Index Score for Project Location (b)	17.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Land use adjusted
Construction: Construction Phases	phasing adjusted per project plan
Construction: Off-Road Equipment	Equipment types adjusted per PD and similar projects. Hours of use conservatively set to 10 hpd.
Construction: Dust From Material Movement	Material export reflects dam removal materials.
Construction: Trips and VMT	Trip lengths set to 35 mi to estimate trips to Ukiah.
Construction: On-Road Fugitive Dust	% pave adjusted to reflect haul routes.

PV - Initial Low Flow Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	PV - Initial Low Flow
Construction Start Date	1/1/2026
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	1.70
Precipitation (days)	56.2
Location	39.408983456493644, -122.96488312478226
County	Lake
City	Unincorporated
Air District	Lake County AQMD
Air Basin	Lake County
TAZ	244
EDFZ	2
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.29

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Industrial	1.00	User Defined Unit	1.00	1.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

Sector	#	Measure Title
Construction	C-10-B	Water Active Demolition Sites

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	9.46	7.95	62.5	97.2	0.14	2.42	686	688	2.23	71.8	74.0	—	19,697	19,697	0.69	0.62	26.3	19,926
Mit.	9.46	7.95	62.5	97.2	0.14	2.42	686	688	2.23	71.8	74.0	—	19,697	19,697	0.69	0.62	26.3	19,926
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	9.49	7.98	62.6	93.4	0.14	2.42	686	688	2.23	71.8	74.0	—	19,552	19,552	0.69	0.62	0.68	19,756
Mit.	9.49	7.98	62.6	93.4	0.14	2.42	686	688	2.23	71.8	74.0	—	19,552	19,552	0.69	0.62	0.68	19,756
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.83	2.37	19.0	27.1	0.04	0.73	175	176	0.67	18.5	19.2	—	5,836	5,836	0.21	0.19	3.42	5,901
Mit.	2.83	2.37	19.0	27.1	0.04	0.73	175	176	0.67	18.5	19.2	—	5,836	5,836	0.21	0.19	3.42	5,901
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.52	0.43	3.46	4.94	0.01	0.13	32.0	32.1	0.12	3.38	3.50	—	966	966	0.03	0.03	0.57	977
Mit.	0.52	0.43	3.46	4.94	0.01	0.13	32.0	32.1	0.12	3.38	3.50	—	966	966	0.03	0.03	0.57	977
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	9.46	7.95	62.5	97.2	0.14	2.42	686	688	2.23	71.8	74.0	—	19,697	19,697	0.69	0.62	26.3	19,926
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	9.49	7.98	62.6	93.4	0.14	2.42	686	688	2.23	71.8	74.0	—	19,552	19,552	0.69	0.62	0.68	19,756
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	2.83	2.37	19.0	27.1	0.04	0.73	175	176	0.67	18.5	19.2	—	5,836	5,836	0.21	0.19	3.42	5,901
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.52	0.43	3.46	4.94	0.01	0.13	32.0	32.1	0.12	3.38	3.50	—	966	966	0.03	0.03	0.57	977

2.3. Construction Emissions by Year, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	9.46	7.95	62.5	97.2	0.14	2.42	686	688	2.23	71.8	74.0	—	19,697	19,697	0.69	0.62	26.3	19,926

Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	9.49	7.98	62.6	93.4	0.14	2.42	686	688	2.23	71.8	74.0	—	19,552	19,552	0.69	0.62	0.68	19,756
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	2.83	2.37	19.0	27.1	0.04	0.73	175	176	0.67	18.5	19.2	—	5,836	5,836	0.21	0.19	3.42	5,901
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.52	0.43	3.46	4.94	0.01	0.13	32.0	32.1	0.12	3.38	3.50	—	966	966	0.03	0.03	0.57	977

3. Construction Emissions Details

3.1. 1. Initial Low-Flow Season Activities (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	7.30	6.12	56.5	57.6	0.11	2.37	—	2.37	2.18	—	2.18	—	11,946	11,946	0.48	0.10	—	11,987
Dust From Material Movement	—	—	—	—	—	—	6.39	6.39	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	7.30	6.12	56.5	57.6	0.11	2.37	—	2.37	2.18	—	2.18	—	11,946	11,946	0.48	0.10	—	11,987
Dust From Material Movement	—	—	—	—	—	—	6.39	6.39	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.20	1.84	17.0	17.4	0.03	0.72	—	0.72	0.66	—	0.66	—	3,600	3,600	0.15	0.03	—	3,612
Dust From Material Movement	—	—	—	—	—	—	1.93	1.93	—	0.99	0.99	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.40	0.34	3.11	3.17	0.01	0.13	—	0.13	0.12	—	0.12	—	596	596	0.02	< 0.005	—	598
Dust From Material Movement	—	—	—	—	—	—	0.35	0.35	—	0.18	0.18	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	2.10	1.77	2.67	39.3	0.00	0.00	623	623	0.00	62.8	62.8	—	5,496	5,496	0.20	0.17	22.3	5,575
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.05	0.05	3.40	0.31	0.03	0.04	56.7	56.8	0.04	5.76	5.80	—	2,255	2,255	< 0.005	0.35	4.03	2,365
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	2.14	1.80	2.67	35.5	0.00	0.00	623	623	0.00	62.8	62.8	—	5,350	5,350	0.21	0.17	0.58	5,407
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.05	0.05	3.43	0.31	0.03	0.04	56.7	56.8	0.04	5.76	5.81	—	2,255	2,255	< 0.005	0.35	0.10	2,361
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.61	0.51	0.90	9.64	0.00	0.00	159	159	0.00	16.0	16.0	—	1,557	1,557	0.07	0.05	2.90	1,577
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.02	0.02	1.06	0.09	0.01	0.01	14.5	14.5	0.01	1.48	1.49	—	680	680	< 0.005	0.11	0.52	712
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.11	0.09	0.17	1.76	0.00	0.00	29.0	29.0	0.00	2.93	2.93	—	258	258	0.01	0.01	0.48	261
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.19	0.02	< 0.005	< 0.005	2.64	2.65	< 0.005	0.27	0.27	—	113	113	< 0.005	0.02	0.09	118

3.2. 1. Initial Low-Flow Season Activities (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road	7.30	6.12	56.5	57.6	0.11	2.37	—	2.37	2.18	—	2.18	—	11,946	11,946	0.48	0.10	—	11,987
Dust From Material Movement	—	—	—	—	—	—	6.39	6.39	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	7.30	6.12	56.5	57.6	0.11	2.37	—	2.37	2.18	—	2.18	—	11,946	11,946	0.48	0.10	—	11,987
Dust From Material Movement	—	—	—	—	—	—	6.39	6.39	—	3.28	3.28	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.20	1.84	17.0	17.4	0.03	0.72	—	0.72	0.66	—	0.66	—	3,600	3,600	0.15	0.03	—	3,612
Dust From Material Movement	—	—	—	—	—	—	1.93	1.93	—	0.99	0.99	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.40	0.34	3.11	3.17	0.01	0.13	—	0.13	0.12	—	0.12	—	596	596	0.02	< 0.005	—	598
Dust From Material Movement	—	—	—	—	—	—	0.35	0.35	—	0.18	0.18	—	—	—	—	—	—	—
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	2.10	1.77	2.67	39.3	0.00	0.00	623	623	0.00	62.8	62.8	—	5,496	5,496	0.20	0.17	22.3	5,575
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.05	0.05	3.40	0.31	0.03	0.04	56.7	56.8	0.04	5.76	5.80	—	2,255	2,255	< 0.005	0.35	4.03	2,365
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	2.14	1.80	2.67	35.5	0.00	0.00	623	623	0.00	62.8	62.8	—	5,350	5,350	0.21	0.17	0.58	5,407
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.05	0.05	3.43	0.31	0.03	0.04	56.7	56.8	0.04	5.76	5.81	—	2,255	2,255	< 0.005	0.35	0.10	2,361
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.61	0.51	0.90	9.64	0.00	0.00	159	159	0.00	16.0	16.0	—	1,557	1,557	0.07	0.05	2.90	1,577
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.02	0.02	1.06	0.09	0.01	0.01	14.5	14.5	0.01	1.48	1.49	—	680	680	< 0.005	0.11	0.52	712
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.11	0.09	0.17	1.76	0.00	0.00	29.0	29.0	0.00	2.93	2.93	—	258	258	0.01	0.01	0.48	261
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.19	0.02	< 0.005	< 0.005	2.64	2.65	< 0.005	0.27	0.27	—	113	113	< 0.005	0.02	0.09	118

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
1. Initial Low-Flow Season Activities	Demolition	6/1/2026	10/30/2026	5.00	110	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

1. Initial Low-Flow Season Activities	Tractors/Loaders/Back	Diesel	Average	2.00	10.0	84.0	0.37
1. Initial Low-Flow Season Activities	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40
1. Initial Low-Flow Season Activities	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73
1. Initial Low-Flow Season Activities	Cranes	Diesel	Average	4.00	10.0	367	0.29
1. Initial Low-Flow Season Activities	Other Construction Equipment	Diesel	Average	4.00	10.0	82.0	0.42

5.2.2. Mitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
1. Initial Low-Flow Season Activities	Tractors/Loaders/Backhoes	Diesel	Average	2.00	10.0	84.0	0.37
1. Initial Low-Flow Season Activities	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40
1. Initial Low-Flow Season Activities	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73
1. Initial Low-Flow Season Activities	Cranes	Diesel	Average	4.00	10.0	367	0.29
1. Initial Low-Flow Season Activities	Other Construction Equipment	Diesel	Average	4.00	10.0	82.0	0.42

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
1. Initial Low-Flow Season Activities	—	—	—	—
1. Initial Low-Flow Season Activities	Worker	200	35.0	LDA,LDT1,LDT2
1. Initial Low-Flow Season Activities	Vendor	—	35.0	HHDT,MHDT
1. Initial Low-Flow Season Activities	Hauling	18.2	35.0	HHDT

1. Initial Low-Flow Season Activities	Onsite truck	—	—	HHDT

5.3.2. Mitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
1. Initial Low-Flow Season Activities	—	—	—	—
1. Initial Low-Flow Season Activities	Worker	200	35.0	LDA,LDT1,LDT2
1. Initial Low-Flow Season Activities	Vendor	—	35.0	HHDT,MHDT
1. Initial Low-Flow Season Activities	Hauling	18.2	35.0	HHDT
1. Initial Low-Flow Season Activities	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Control Strategies Applied	PM10 Reduction	PM2.5 Reduction
Apply dust suppressants to unpaved roads	84%	84%
Limit vehicle speeds on unpaved roads to 25 mph	44%	44%

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
1. Initial Low-Flow Season Activities	—	16,000	82.5	—	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
User Defined Industrial	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2026	0.00	204	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

5.18.2.2. Mitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	18.5	annual days of extreme heat
Extreme Precipitation	22.6	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	44.1	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A

Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	24.9
AQ-PM	0.41
AQ-DPM	2.92
Drinking Water	5.42
Lead Risk Housing	47.3
Pesticides	59.8
Toxic Releases	0.00
Traffic	0.82
Effect Indicators	—
CleanUp Sites	74.9
Groundwater	71.1
Haz Waste Facilities/Generators	3.64
Impaired Water Bodies	51.2
Solid Waste	86.5

Sensitive Population	—
Asthma	66.0
Cardio-vascular	46.6
Low Birth Weights	16.2
Socioeconomic Factor Indicators	—
Education	47.5
Housing	47.6
Linguistic	13.3
Poverty	66.9
Unemployment	94.5

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	19.83831644
Employed	2.425253433
Median HI	7.86603362
Education	—
Bachelor's or higher	26.78044399
High school enrollment	100
Preschool enrollment	21.59630438
Transportation	—
Auto Access	51.48209932
Active commuting	56.26844604
Social	—
2-parent households	9.264724753
Voting	51.17413063

Neighborhood	—
Alcohol availability	78.59617606
Park access	29.16720133
Retail density	2.412421404
Supermarket access	19.96663673
Tree canopy	93.12203259
Housing	—
Homeownership	63.41588605
Housing habitability	49.87809573
Low-inc homeowner severe housing cost burden	40.43372257
Low-inc renter severe housing cost burden	16.47632491
Uncrowded housing	58.74502759
Health Outcomes	—
Insured adults	18.06749647
Arthritis	0.0
Asthma ER Admissions	66.9
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	8.8
Cognitively Disabled	21.0
Physically Disabled	1.4
Heart Attack ER Admissions	60.3
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0

Obesity	0.0
Pedestrian Injuries	63.8
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	20.7
SLR Inundation Area	0.0
Children	77.6
Elderly	12.0
English Speaking	92.2
Foreign-born	4.2
Outdoor Workers	10.9
Climate Change Adaptive Capacity	—
Impervious Surface Cover	96.8
Traffic Density	0.5
Traffic Access	0.0
Other Indices	—
Hardship	74.7
Other Decision Support	—
2016 Voting	44.9

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	35.0

Healthy Places Index Score for Project Location (b)	17.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Land use adjusted
Construction: Construction Phases	phasing adjusted per project plan
Construction: Off-Road Equipment	Equipment types adjusted per PD and similar projects. Hours of use conservatively set to 10 hpd.
Construction: Dust From Material Movement	Material export reflects dam removal materials.
Construction: Trips and VMT	Trip lengths set to 35 mi to estimate trips to Ukiah.
Construction: On-Road Fugitive Dust	% pave adjusted to reflect haul routes.

PV - Rec Facility Removal Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	PV - Rec Facility Removal
Construction Start Date	1/1/2026
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	1.70
Precipitation (days)	56.2
Location	39.408983456493644, -122.96488312478226
County	Lake
City	Unincorporated
Air District	Lake County AQMD
Air Basin	Lake County
TAZ	244
EDFZ	2
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.29

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Industrial	1.00	User Defined Unit	1.00	1.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

Sector	#	Measure Title
Construction	C-10-B	Water Active Demolition Sites

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.51	3.78	32.4	39.5	0.06	1.20	140	141	1.10	14.1	15.2	—	7,113	7,113	0.26	0.18	5.57	7,177
Mit.	4.51	3.78	32.4	39.5	0.06	1.20	140	141	1.10	14.1	15.2	—	7,113	7,113	0.26	0.18	5.57	7,177
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.52	3.79	32.4	38.8	0.06	1.20	140	141	1.10	14.1	15.2	—	7,083	7,083	0.26	0.18	0.14	7,142
Mit.	4.52	3.79	32.4	38.8	0.06	1.20	140	141	1.10	14.1	15.2	—	7,083	7,083	0.26	0.18	0.14	7,142
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.56	2.15	18.5	22.0	0.03	0.66	70.4	71.1	0.61	7.11	7.72	—	4,161	4,161	0.15	0.10	1.33	4,197
Mit.	2.56	2.15	18.5	22.0	0.03	0.66	70.4	71.1	0.61	7.11	7.72	—	4,161	4,161	0.15	0.10	1.33	4,197
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.47	0.39	3.38	4.01	0.01	0.12	12.8	13.0	0.11	1.30	1.41	—	689	689	0.03	0.02	0.22	695
Mit.	0.47	0.39	3.38	4.01	0.01	0.12	12.8	13.0	0.11	1.30	1.41	—	689	689	0.03	0.02	0.22	695
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	4.51	3.78	32.4	39.5	0.06	1.20	140	141	1.10	14.1	15.2	—	7,113	7,113	0.26	0.18	5.57	7,177
2027	4.36	3.64	31.1	38.4	0.06	1.11	140	141	1.03	14.1	15.2	—	7,082	7,082	0.26	0.18	5.20	7,146
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	4.52	3.79	32.4	38.8	0.06	1.20	140	141	1.10	14.1	15.2	—	7,083	7,083	0.26	0.18	0.14	7,142
2027	4.33	3.65	31.2	37.7	0.06	1.11	140	141	1.03	14.1	15.2	—	7,053	7,053	0.26	0.18	0.13	7,112
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	1.88	1.58	13.6	15.9	0.03	0.50	49.7	50.2	0.46	5.02	5.48	—	2,951	2,951	0.11	0.07	1.01	2,977
2027	2.56	2.15	18.5	22.0	0.03	0.66	70.4	71.1	0.61	7.11	7.72	—	4,161	4,161	0.15	0.10	1.33	4,197
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.34	0.29	2.48	2.91	< 0.005	0.09	9.07	9.16	0.08	0.92	1.00	—	489	489	0.02	0.01	0.17	493
2027	0.47	0.39	3.38	4.01	0.01	0.12	12.8	13.0	0.11	1.30	1.41	—	689	689	0.03	0.02	0.22	695

2.3. Construction Emissions by Year, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	4.51	3.78	32.4	39.5	0.06	1.20	140	141	1.10	14.1	15.2	—	7,113	7,113	0.26	0.18	5.57	7,177
2027	4.36	3.64	31.1	38.4	0.06	1.11	140	141	1.03	14.1	15.2	—	7,082	7,082	0.26	0.18	5.20	7,146
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	4.52	3.79	32.4	38.8	0.06	1.20	140	141	1.10	14.1	15.2	—	7,083	7,083	0.26	0.18	0.14	7,142
2027	4.33	3.65	31.2	37.7	0.06	1.11	140	141	1.03	14.1	15.2	—	7,053	7,053	0.26	0.18	0.13	7,112
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	1.88	1.58	13.6	15.9	0.03	0.50	49.7	50.2	0.46	5.02	5.48	—	2,951	2,951	0.11	0.07	1.01	2,977
2027	2.56	2.15	18.5	22.0	0.03	0.66	70.4	71.1	0.61	7.11	7.72	—	4,161	4,161	0.15	0.10	1.33	4,197
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.34	0.29	2.48	2.91	< 0.005	0.09	9.07	9.16	0.08	0.92	1.00	—	489	489	0.02	0.01	0.17	493
2027	0.47	0.39	3.38	4.01	0.01	0.12	12.8	13.0	0.11	1.30	1.41	—	689	689	0.03	0.02	0.22	695

3. Construction Emissions Details

3.1. Recreation Facility Removal (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	4.08	3.41	30.9	31.6	0.05	1.19	—	1.19	1.09	—	1.09	—	5,393	5,393	0.22	0.04	—	5,412

Demoliti	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	4.08	3.41	30.9	31.6	0.05	1.19	—	1.19	1.09	—	1.09	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.71	1.43	13.0	13.2	0.02	0.50	—	0.50	0.46	—	0.46	—	2,259	2,259	0.09	0.02	—	2,266
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.31	0.26	2.36	2.41	< 0.005	0.09	—	0.09	0.08	—	0.08	—	374	374	0.02	< 0.005	—	375
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.42	0.35	0.53	7.85	0.00	0.00	125	125	0.00	12.6	12.6	—	1,099	1,099	0.04	0.03	4.46	1,115
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.94	0.08	0.01	0.01	15.6	15.6	0.01	1.58	1.60	—	620	620	< 0.005	0.10	1.11	650
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.43	0.36	0.53	7.10	0.00	0.00	125	125	0.00	12.6	12.6	—	1,070	1,070	0.04	0.03	0.12	1,081
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.94	0.09	0.01	0.01	15.6	15.6	0.01	1.58	1.60	—	620	620	< 0.005	0.10	0.03	649
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.17	0.14	0.25	2.68	0.00	0.00	44.2	44.2	0.00	4.46	4.46	—	433	433	0.02	0.01	0.81	438
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.41	0.04	< 0.005	< 0.005	5.54	5.54	< 0.005	0.56	0.57	—	260	260	< 0.005	0.04	0.20	272
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.05	0.49	0.00	0.00	8.06	8.06	0.00	0.81	0.81	—	71.6	71.6	< 0.005	< 0.005	0.13	72.5
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.07	0.01	< 0.005	< 0.005	1.01	1.01	< 0.005	0.10	0.10	—	43.0	43.0	< 0.005	0.01	0.03	45.1

3.2. Recreation Facility Removal (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipm	4.08	3.41	30.9	31.6	0.05	1.19	—	1.19	1.09	—	1.09	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	4.08	3.41	30.9	31.6	0.05	1.19	—	1.19	1.09	—	1.09	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.71	1.43	13.0	13.2	0.02	0.50	—	0.50	0.46	—	0.46	—	2,259	2,259	0.09	0.02	—	2,266
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.31	0.26	2.36	2.41	< 0.005	0.09	—	0.09	0.08	—	0.08	—	374	374	0.02	< 0.005	—	375
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.42	0.35	0.53	7.85	0.00	0.00	125	125	0.00	12.6	12.6	—	1,099	1,099	0.04	0.03	4.46	1,115
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.94	0.08	0.01	0.01	15.6	15.6	0.01	1.58	1.60	—	620	620	< 0.005	0.10	1.11	650
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.43	0.36	0.53	7.10	0.00	0.00	125	125	0.00	12.6	12.6	—	1,070	1,070	0.04	0.03	0.12	1,081
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.94	0.09	0.01	0.01	15.6	15.6	0.01	1.58	1.60	—	620	620	< 0.005	0.10	0.03	649
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.17	0.14	0.25	2.68	0.00	0.00	44.2	44.2	0.00	4.46	4.46	—	433	433	0.02	0.01	0.81	438
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.41	0.04	< 0.005	< 0.005	5.54	5.54	< 0.005	0.56	0.57	—	260	260	< 0.005	0.04	0.20	272
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.05	0.49	0.00	0.00	8.06	8.06	0.00	0.81	0.81	—	71.6	71.6	< 0.005	< 0.005	0.13	72.5
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.07	0.01	< 0.005	< 0.005	1.01	1.01	< 0.005	0.10	0.10	—	43.0	43.0	< 0.005	0.01	0.03	45.1

3.3. Recreation Facility Removal (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road	3.93	3.29	29.8	31.1	0.05	1.10	—	1.10	1.01	—	1.01	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.93	3.29	29.8	31.1	0.05	1.10	—	1.10	1.01	—	1.01	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.33	1.95	17.7	18.4	0.03	0.65	—	0.65	0.60	—	0.60	—	3,198	3,198	0.13	0.03	—	3,209
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.43	0.36	3.22	3.36	0.01	0.12	—	0.12	0.11	—	0.11	—	529	529	0.02	< 0.005	—	531
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.41	0.34	0.47	7.20	0.00	0.00	125	125	0.00	12.6	12.6	—	1,079	1,079	0.04	0.03	4.17	1,095
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.90	0.08	< 0.005	0.01	15.6	15.6	0.01	1.58	1.60	—	609	609	< 0.005	0.10	1.03	640
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.38	0.35	0.47	6.54	0.00	0.00	125	125	0.00	12.6	12.6	—	1,051	1,051	0.04	0.03	0.11	1,062
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.91	0.09	< 0.005	0.01	15.6	15.6	0.01	1.58	1.60	—	610	610	< 0.005	0.10	0.03	639
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.22	0.20	0.32	3.50	0.00	0.00	62.6	62.6	0.00	6.31	6.31	—	601	601	0.03	0.02	1.07	609
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.56	0.05	< 0.005	0.01	7.84	7.85	0.01	0.80	0.81	—	361	361	< 0.005	0.06	0.26	379
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.04	0.06	0.64	0.00	0.00	11.4	11.4	0.00	1.15	1.15	—	99.6	99.6	< 0.005	< 0.005	0.18	101
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.10	0.01	< 0.005	< 0.005	1.43	1.43	< 0.005	0.15	0.15	—	59.8	59.8	< 0.005	0.01	0.04	62.7

3.4. Recreation Facility Removal (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road	3.93	3.29	29.8	31.1	0.05	1.10	—	1.10	1.01	—	1.01	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.93	3.29	29.8	31.1	0.05	1.10	—	1.10	1.01	—	1.01	—	5,393	5,393	0.22	0.04	—	5,412
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.33	1.95	17.7	18.4	0.03	0.65	—	0.65	0.60	—	0.60	—	3,198	3,198	0.13	0.03	—	3,209
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.43	0.36	3.22	3.36	0.01	0.12	—	0.12	0.11	—	0.11	—	529	529	0.02	< 0.005	—	531
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.41	0.34	0.47	7.20	0.00	0.00	125	125	0.00	12.6	12.6	—	1,079	1,079	0.04	0.03	4.17	1,095
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.90	0.08	< 0.005	0.01	15.6	15.6	0.01	1.58	1.60	—	609	609	< 0.005	0.10	1.03	640
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.38	0.35	0.47	6.54	0.00	0.00	125	125	0.00	12.6	12.6	—	1,051	1,051	0.04	0.03	0.11	1,062
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.91	0.09	< 0.005	0.01	15.6	15.6	0.01	1.58	1.60	—	610	610	< 0.005	0.10	0.03	639
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.22	0.20	0.32	3.50	0.00	0.00	62.6	62.6	0.00	6.31	6.31	—	601	601	0.03	0.02	1.07	609
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	0.01	0.56	0.05	< 0.005	0.01	7.84	7.85	0.01	0.80	0.81	—	361	361	< 0.005	0.06	0.26	379
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.04	0.06	0.64	0.00	0.00	11.4	11.4	0.00	1.15	1.15	—	99.6	99.6	< 0.005	< 0.005	0.18	101
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.10	0.01	< 0.005	< 0.005	1.43	1.43	< 0.005	0.15	0.15	—	59.8	59.8	< 0.005	0.01	0.04	62.7

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Remove	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Recreation Facility Removal	Demolition	6/1/2026	10/30/2027	5.00	370	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Recreation Facility Removal	Tractors/Loaders/Backhoes	Diesel	Average	2.00	10.0	84.0	0.37
Recreation Facility Removal	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40
Recreation Facility Removal	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73

5.2.2. Mitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Recreation Facility Removal	Tractors/Loaders/Backhoes	Diesel	Average	2.00	10.0	84.0	0.37
Recreation Facility Removal	Rubber Tired Dozers	Diesel	Average	2.00	10.0	367	0.40
Recreation Facility Removal	Concrete/Industrial Saws	Diesel	Average	4.00	10.0	33.0	0.73

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Recreation Facility Removal	—	—	—	—
Recreation Facility Removal	Worker	40.0	35.0	LDA,LDT1,LDT2
Recreation Facility Removal	Vendor	—	35.0	HHDT,MHDT
Recreation Facility Removal	Hauling	5.00	35.0	HHDT
Recreation Facility Removal	Onsite truck	—	—	HHDT

5.3.2. Mitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Recreation Facility Removal	—	—	—	—
Recreation Facility Removal	Worker	40.0	35.0	LDA,LDT1,LDT2
Recreation Facility Removal	Vendor	—	35.0	HHDT,MHDT
Recreation Facility Removal	Hauling	5.00	35.0	HHDT
Recreation Facility Removal	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Control Strategies Applied	PM10 Reduction	PM2.5 Reduction
Apply dust suppressants to unpaved roads	84%	84%
Limit vehicle speeds on unpaved roads to 25 mph	44%	44%

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Recreation Facility Removal	0.00	0.00	0.00	—	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
User Defined Industrial	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2026	0.00	204	0.03	< 0.005
2027	0.00	204	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

5.18.2.2. Mitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	18.5	annual days of extreme heat
Extreme Precipitation	22.6	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	44.1	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	24.9
AQ-PM	0.41
AQ-DPM	2.92
Drinking Water	5.42
Lead Risk Housing	47.3

Pesticides	59.8
Toxic Releases	0.00
Traffic	0.82
Effect Indicators	—
CleanUp Sites	74.9
Groundwater	71.1
Haz Waste Facilities/Generators	3.64
Impaired Water Bodies	51.2
Solid Waste	86.5
Sensitive Population	—
Asthma	66.0
Cardio-vascular	46.6
Low Birth Weights	16.2
Socioeconomic Factor Indicators	—
Education	47.5
Housing	47.6
Linguistic	13.3
Poverty	66.9
Unemployment	94.5

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	19.83831644
Employed	2.425253433
Median HI	7.86603362
Education	—

Bachelor's or higher	26.78044399
High school enrollment	100
Preschool enrollment	21.59630438
Transportation	—
Auto Access	51.48209932
Active commuting	56.26844604
Social	—
2-parent households	9.264724753
Voting	51.17413063
Neighborhood	—
Alcohol availability	78.59617606
Park access	29.16720133
Retail density	2.412421404
Supermarket access	19.96663673
Tree canopy	93.12203259
Housing	—
Homeownership	63.41588605
Housing habitability	49.87809573
Low-inc homeowner severe housing cost burden	40.43372257
Low-inc renter severe housing cost burden	16.47632491
Uncrowded housing	58.74502759
Health Outcomes	—
Insured adults	18.06749647
Arthritis	0.0
Asthma ER Admissions	66.9
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0

Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	8.8
Cognitively Disabled	21.0
Physically Disabled	1.4
Heart Attack ER Admissions	60.3
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	63.8
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	20.7
SLR Inundation Area	0.0
Children	77.6
Elderly	12.0
English Speaking	92.2
Foreign-born	4.2
Outdoor Workers	10.9
Climate Change Adaptive Capacity	—
Impervious Surface Cover	96.8
Traffic Density	0.5

Traffic Access	0.0
Other Indices	—
Hardship	74.7
Other Decision Support	—
2016 Voting	44.9

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	35.0
Healthy Places Index Score for Project Location (b)	17.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Land use adjusted
Construction: Construction Phases	phasing adjusted per project plan

Construction: Off-Road Equipment	Equipment types adjusted per PD and similar projects. Hours of use conservatively set to 10 hpd.
Construction: Dust From Material Movement	Material export reflects dam removal materials.
Construction: Trips and VMT	Trip lengths set to 35 mi to estimate trips to Ukiah. Additional haul trips added during phases 2 and 4.
Construction: On-Road Fugitive Dust	% pave adjusted to reflect haul routes.

TABLE OF CONTENTS

List of Appendices

List of Acronyms

dB	decibel
dBA	A-weighted decibel(s)
DNL	Day/Night Noise Level
ft.	feet
FTA	Federal Transit Administration
HUD	U.S. Department of Housing and Urban Development
in/sec	inches per second
mph	miles per hour
PG&E	Pacific Gas and Electric Company
PPV	peak particle velocity
Project	Potter Valley Hydroelectric Project
U.S.	United States

This Page Intentionally Left Blank

3.4.1.17 Noise and Vibration

This section describes the potential effects related to noise that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Refer to Section 3.4.1 for a description of each phase.

The effects are determined by analyzing the changes in the noise environment that may result from activities to be implemented under the Proposed Action compared to the No-action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential effects related to noise resulting from the Project were evaluated:

- Temporary noise and vibration from ground-operated off-road equipment;
- Temporary noise from truck hauling of materials and equipment; and
- Temporary noise from helicopter use for movement of equipment and material.

Approach to Analysis

This analysis was based on the noise and vibration levels known to occur from typical construction equipment, including the use of blasting for removal of the adit plug. The anticipated noise and vibration levels at sensitive receptor locations were then compared to the existing ambient environment. The potential increase in noise was considered in comparison to the following standards: 1 A-weighted decibel (dBA) increase is imperceptible, 3 dBA increase is barely perceptible, 5 dBA increase is clearly noticeable, and 10 dBA increase is subjectively perceived as approximately twice as loud (Caltrans 2013). The potential increase in groundborne vibration was considered in comparison to the effects of vibration on people and buildings, as presented in Table 3.3.16-3 in Section 3.3.16.

<u>Off-Road Equipment</u>

Construction and demolition activities associated with the Project would require the use of numerous pieces of noise- and vibration-generating equipment, such as backhoes, bulldozers, excavators, scrapers, and more. Table 3.3.16-2 in Section 3.3.16 presents the typical maximum noise levels for equipment commonly used in general construction projects at full-power operation at a distance of 50 feet (ft.). As shown in the table, construction equipment typically generates 74 to 89 dBA of noise at 50 ft. away. In addition, this analysis considers blasting for removal of the adit plug under this category. As also presented in Table 3.3.16-2, blasting results in approximately 94 dBA at 50 ft. away. The noise level from Project activities at sensitive receptor locations was estimated based on the principle that sound from a point source generally attenuates at a rate of 6 decibels (dB) per doubling distance. Therefore, the reference noise level was adjusted in 6-dB increments based on how many times the 50-ft distance was doubled between the construction area and the nearest receptor.

Table 3.3.16-4 in Section 3.3.16 presents the typical vibration levels for equipment commonly used in demolition projects at a distance of 25 ft. As shown in the table, off-road equipment typically generates 0.003 to 0.644 peak particle velocity (PPV) inches per second (in/sec) at 25 ft. away. The level of vibration experiences at sensitive receptor locations was estimated using Equation 7-2 from the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual (FTA 2018).

$$PPV_{equip} = PPV_{ref} \times (\frac{25}{D})^{1.5} \quad \textbf{Eq. 7-2}$$

where:

PPV_{equip} = the peak particle velocity of the equipment adjusted for distance, in/sec

PPV_{ref} = the source reference vibration level at 25 ft, in/sec

D = distance from the equipment to the receiver, ft

All off-road equipment noise and vibration calculations are included as Appendix 3.4.1.17-A.

<u>Haul Trucks</u>

The regular use of heavy-duty haul trucks on area roadways would contribute to the noise environment. The noise level from Project haul trucks was estimated at receptor locations using the United States (U.S.) Department of Housing and Urban Development (HUD) Exchange Day/Night Noise Level (DNL) Calculator. The assumptions for truck traffic volumes are presented in each analysis section.

<u>Helicopter Use</u>

Helicopters may be used to transport materials or large pieces of equipment, and receptor locations would be exposed to brief and intermittent helicopter noise. It is assumed that helicopters would land at the Gravelly Valley Airport, located immediately north of Lake Pillsbury, and the helipad located at the Potter Valley Powerhouse site. Potential noise effects from the use of helicopters are discussed qualitatively in this analysis.

Scott Dam Area

Removal of Scott Dam is expected to take occur intermittently over the course of two years. More specifically, decommissioning activities for Scott Dam and associated facilities were assumed to occur in four total phases: (1) initial low-flow season (June–October), (2) first high-flow season

(November–May), (3) first low-flow season after sediment flushing (June–October), and (4) recreational facility removal (November–May). It is noted that construction phase timing is dependent on flow conditions; for example, Phase 2, First High-Flow Season Activities, will occur during the next wet season, which may not occur immediately after Phase 1. Project activities would temporarily generate noise from the use of off-road equipment and truck hauling. In addition, helicopters may be used to facilitate material transport during the Project. Off-road equipment use, truck hauling, and helicopter use would cause temporary increases to ambient noise levels during construction activities. The following subsections provide more detail on the noise exposure associated with each of the three categories of construction noise: construction equipment, truck hauling, and helicopter use.

Off-Road Equipment

The nearest residence to the demolition area is located approximately 1,400 ft. southwest of Scott Dam (see Map 3.3.16-1), and the ambient noise environment was estimated to be roughly 40 dBA. Because construction and demolition activities are not expected to occur within 500 ft. of receptors, Lake County General Plan Policy N-1.7 would not be applicable. Lake County does not have an adopted noise ordinance.

The estimated noise from off-road equipment experienced at the nearest sensitive receptor would range from 47 to 62 dB. The estimated noise from blasting at the nearest receptor would be approximately 67 dB. As a result, the use of off-road equipment associated with the Project could result in a temporary increase in noise up to 27 dB. However, construction and demolition activities would be temporary and would only occur during daytime hours. In addition, blasting of the adit plug would be a one-time occurrence. Implementation of the General Construction Measures, which include noise reduction measures, would reduce noise impacts to the maximum extent feasible. A complete list of construction measures is included in Section 2.2.3. Even with the implementation of the proposed noise reduction measures, the increase in noise from the use of off-road equipment may still exceed the ambient noise environment by more than 5 dBA, which is considered "clearly noticeable." Therefore, during construction activities, receptors within the Scott Dam Area maybe exposed to a significant adverse effect related to noise from off-road equipment.

Should impact pile drivers be used during demolition of Scott Dam, the estimated maximum groundborne vibration level from off-road equipment experience at the nearest sensitive receptor would be 0.0015 in/sec PPV. This is well below the threshold for damage to buildings and the threshold of human perception. No impacts are expected to occur related to vibration.

Haul Trucks

Several roads, including County Road 301, Kapranos Road, Elk Mountain Road, Rice Fork Road, Gravel Cutoff Road, Logging Road (M8), Gage E2 Access Road, Scott Dam Road, Upper Scott Dam Access Road, and roads associated with the resort and residences, are located in the Scott Dam Area Study Region (see Map 3.3.17-1). It is assumed that haul trucks would transport material along Scott Dam Road and southward along County Road 301. The receptors closest to the assumed haul route within the Scott Dam Area are located approximately 2,000 ft. south of

Scott Dam Road. Based on the Scott Dam removal timeline and the anticipated volume of material to be exported, it was assumed that a maximum of 105 haul truck trips per day would be required during peak construction. At an effective distance of 2,000 ft. away, 105 daily truck trips traveling at an assumed speed of 25 miles per hour (mph) would generate a DNL of 40 dB (HUD 2024). The DNL is the average noise level over a 24-hour period. The expected noise from haul truck trips experienced at receptors would not exceed the existing ambient noise level, and, as a result, the impact would not be significant. Furthermore, implementation of the Construction Noise Measures, which prohibit the use of engine braking (i.e., jake brakes), would ensure that potential noise would be reduced to the maximum extent feasible. Therefore, the use of haul trucks during construction activities under the Proposed Action would have a negligible effect on receptors in the Scott Dam Area.

Helicopter Use

Under existing conditions, aircraft flyovers associated with the Gravelly Valley Airport, north of Lake Pillsbury, contribute to intermittent increases in ambient noise in the Scott Dam Area. The Gravelly Valley Airport serves an average of 83 takeoffs and landings per month (AirNav 2024), or an average of 2.7 flyover events per day. If helicopters are used for Project activities, the number of aircraft flyover events would increase and intermittent noise impacts may occur. The Gravelly Valley Airport is located in an unpopulated, forested area; as a result, an increase in landing/takeoff cycles would not be expected to adversely affect residents. However, flyover events may increase noise for receptors. The required Construction Noise Measures, which would ensure that helicopters operate during daytime hours only, would reduce potential noise impacts to the maximum extent feasible. Nevertheless, even with the implementation of the proposed noise reduction measures, the increase in noise from helicopter flyovers may still be considered significant. Therefore, a significant temporary adverse effect during construction activities may occur related to noise from helicopters on receptors in the Scott Dam Area.

Cape Horn Dam Area

Removal of Cape Horn Dam would be completed intermittently over the course of roughly 12 to 18 months. As with the activities proposed in the Scott Dam Area, noise would be generated in the Cape Horn Dam Area from the use of off-road construction and demolition equipment, heavy-duty truck trips for material hauling, and helicopter use. The following subsections evaluate potential impacts associated with each of the three categories of construction noise.

Off-Road Equipment

The nearest residence to the demolition area is located approximately 1,000 ft. east of Cape Horn Dam (see Map 3.3.16-2), and the ambient noise environment is estimated to be roughly 45 dBA. Mendocino County does not have an adopted noise ordinance.

The estimated noise from off-road equipment experienced at the nearest sensitive receptor would range from 50 to 65 dB. The estimated noise from blasting at the nearest receptor would be approximately 67 dB. As a result, the use of off-road equipment associated with the Project could result in a temporary increase in noise up to 22 dB. This is a significant increase in noise level compared to the existing conditions. However, construction and demolition activities would be temporary and will only occur during daytime hours. In addition, blasting would be a one-time occurrence. Implementation of the Construction Noise Measures would reduce noise impacts to the maximum extent feasible. Even with the implementation of the proposed noise reduction measures, the increase in noise from the use of off-road equipment may still exceed the ambient noise environment by more than 5 dBA, which is considered "clearly noticeable." Therefore, a significant temporary adverse effect may occur during construction activities related to noise from off-road equipment on receptors in the Cape Horn Dam Area.

Should impact pile drivers be used during demolition of Cape Horn Dam, the estimated maximum groundborne vibration level from off-road equipment experience at the nearest sensitive receptor would be 0.0025 in/sec PPV. This is well below the threshold for damage to buildings and the threshold of human perception. No impacts are expected to occur related to vibration.

Haul Trucks

Several roads are located in the Cape Horn Dam Area Study Region, including roads associated with the residences; Ridgeway Highway; Logging Road (M8); Van Arsdale Road; Eel River Road; Cutoff Road; Cape Horn Dam East Access Road; Intake Access Road; Penstock, Pipeline, and Butterfly Valve House Access Road; and Powerhouse Main Access Road (see Map 3.3.17-2). It is assumed that haul trucks would transport material along Ridgeway Highway and southward along Eel River Road. The receptors closest to the assumed haul route within the Cape Horn Dam Area are located approximately 100 ft. east of Ridgeway Highway. Based on the Cape Horn Dam removal timeline and the anticipated volume of material to be exported, it was assumed that a maximum of 20 haul truck trips per day would be required during the peak construction period. At an effective distance of 100 ft. away, 20 daily truck trips traveling at an assumed speed of 25 mph would generate a DNL of 53 dB (HUD 2024). The expected noise from haul truck trips experienced at receptors would exceed the existing ambient noise level. However, implementation of the Construction Noise Measures, which prohibit the use of engine braking, would ensure that potential noise would be reduced to the maximum extent feasible. Overall, the use of haul trucks during construction activities under the Proposed Action would have a negligible effect on receptors in the Cape Horn Dam Area.

Helicopter Flights

If helicopters are used during Project activities in the Cape Horn Dam Area, intermittent noise impacts to receptors may occur. Helicopters associated with work at the Cape Horn Dam Area are assumed to use the landing pad located at the Potter Valley Powerhouse site, which is not currently used as an active landing site. Therefore, any increase in helicopter activity (i.e., landing/takeoff cycles and aircraft flyover events) may be considered significant in comparison to the existing conditions. The required Construction Noise Measures, which would ensure that helicopters operate during daytime hours only, would reduce potential noise impacts to the maximum extent feasible. Even with the implementation of the proposed noise reduction measures, the increase in noise from helicopter use may still be considered significant. Therefore, a significant temporary adverse effect may occur during construction activities related to noise from helicopters on receptors in the Cape Horn Dam Area.

Eel River Watershed and Russian River Watershed

The Southern Eel River Watershed Study Region and Northern Russian River Watershed Study Region are both heavily forested and rural in nature. The ambient noise environment is primarily defined by vehicle traffic on area roadways, with higher ambient noise levels in more developed regions, such as the community of Potter Valley. Off-road equipment noise is localized to the general construction area. Impacts related to off-road equipment use were evaluated for the receptors located nearest to the construction areas in the discussion above.

It was assumed that the haul route would generally transport materials from Scott Dam along Forest Route 20N past the Cape Horn Dam Area, along Eel River Road, through the community of Potter Valley along Potter Valley Road, westbound along Highway 20, southbound on Highway 101, and terminating in the city of Ukiah (see Map 3.4.1.18-1). As of 2022, the segment of Highway 101 through Redwood Valley experiences a maximum of 24,000 average daily vehicle trips, and the segment of Highway 20 immediately east of Redwood Valley experiences a maximum of 11,500 average daily vehicle trips (Caltrans 2024). The addition of up to 105 one-way truck trips per day would represent between a 0.4 and 0.9 percent increase in traffic compared to the existing conditions. The 0.4 to 0.9 percent increase in haul truck traffic along the haul route is expected to result in a negligible increase in noise to receptors along the haul route. Similarly, the use of helicopters may temporarily increase the noise environment for receptors along the flight path. Nevertheless, the hauling period and/or use of helicopters would be limited to a couple of months per Project phase. Additionally, material transport is assumed to occur primarily during daytime hours, which are considered less noise-sensitive. Finally, implementation of the Construction Noise Measures would ensure that haul trucks do not use engine braking. Overall, the noise impacts during construction activities under the Proposed Action would have a negligible effect on receptors located in the Eel River and Russian River watersheds.

Phase 2: Post-facility Removal Effects

The following potential post-facility removal effects to noise resulting from physical changes that occur following dam and recreation facility/ancillary facility removal, including restoration, were evaluated:

- Potential noise effects of restoration and resulting effects.

Scott Dam Area, Cape Horn Dam Area, Eel River Watershed, and Russian River Watershed

Following the proposed removal of Scott Dam and Cape Horn Dam and associated facilities, noise associated with restoration activities and the resulting effects would be minimal. Noise may be generated from employee commutes to the sites during restoration activities; however, this level of noise is expected to be less than what occurs under existing conditions. As a result, no effects related to noise would occur and environmental measures are not proposed.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam the same year. Under this option, sediment would be flushed through the system and downstream the Eel River within the same season.

There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam.

If the Scott Dam adit were removed and sediment flushed in a year prior to removal of Cape Horn Dam, mechanical removal of sediment behind Cape Horn Dam would be required and may extend the construction period, with associated noise effects. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice.

If Cape Horn Dam was removed in a year prior Scott Dam, when Scott Dam is removed, sediment may bury or partially bury the newly constructed NERF intake. Additional construction may be required to remove sediment at the NERF intake, and sediment could be diverted to the East Branch Russian River via the NERF diversion. The duration of the construction period may be extended under this dam removal sequencing option due to the additional construction required to remove sediment which would also extend the noise effects from construction equipment.

In both alternate dam removal sequencing options, noise would be generated due to construction activities regardless of which dam is removed first. Although the length of the construction period may vary depending on the dam removal sequencing option, the level of noise from construction would not be substantially different under each option. As a result, there would be no measurable difference in potential noise impacts from the sequencing options for the removal of Scott Dam and Cape Horn Dam.

Construction and Environmental Measures

To avoid or reduce effects related to noise during construction, PG&E will obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- General Construction Measures, including implementation of noise reduction measures

Unavoidable Adverse Effects

The Proposed Action would result in temporary and brief unavoidable adverse noise effects at noise-sensitive areas associated with the use of off-road construction equipment and helicopters.

There are no unavoidable adverse noise effects from physical changes that occur following dam and recreation facility/ancillary facility removal, including restoration, under the Proposed Action.

References

AirNav. 2024. 1Q5 Gravelly Valley Airport, Upper Lake, California, USA. Available at: http://airnav.com/airport/1q5. Accessed April 2024.

Caltrans (California Department of Transportation). 2024. Traffic Census Program, 2022 AADT. Available at: https://dot.ca.gov/programs/traffic-operations/census. Accessed April 2024.

Caltrans (California Department of Transportation). 2013. Technical Noise Supplement Traffic Noise Analysis Protocol. Available at: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf. Accessed April 2024.

Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. Available online at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf. Accessed April 2024.

U.S. Department of Housing and Urban Development (HUD). 2024. Day/Night Noise Level (DNL) Calculator. Available online at: https://www.hudexchange.info/environmental-review/dnl-calculator/. Accessed October 2024.

Appendix 3.4.1.17-A

Noise and Vibration Calculations

Table 1: Off-Road Equipment Noise Calculations (General Equipment)
Table 2: Off-Road Equipment Noise Calculations (Blasting)
Table 3: Off-Road Equipment Vibration Calculations

This Page Intentionally Left Blank

Table 1: Off-Road Equipment Noise Calculations (General Equipment)

	Equipment Minimum (dB)	Equipment Maximum (dB)
Reference Value (50 ft)	74	89
Scott Dam Nearest Receptor (1,400 ft)	47	62
Cape Horn Dam Nearest Receptor (1,000 ft)	50	65

Table 2: Off-Road Equipment Noise Calculations (Blasting)

	Equipment Minimum (dB)
Reference Value (50 ft)	94
Scott Dam Nearest Receptor (1,400 ft)	67
Cape Horn Dam Nearest Receptor (1,000 ft)	70

Table 3: Off-Road Equipment Vibration Calculations

	Equipment Minimum (PPV in/sec)	Equipment Maximum (PPV in/sec)
Reference Value (50 ft)	0.003	0.644
Scott Dam Nearest Receptor (1,400 ft)	0.0000	0.0015
Cape Horn Dam Nearest Receptor (1,000 ft)	0.0000	0.0025

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Maps

List of Acronyms

CY	cubic yards
LOS	level of service
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
USFS	United States Forest Service
VMT	vehicle miles traveled

This Page Intentionally Left Blank

3.4.1.18 Traffic

This section describes the potential effects related to traffic that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project), which is described in Section 2.2. Section 2.2 includes a description of decommissioning Project facilities and restoration goals to be met as part of the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Refer to Section 3.4.1 for a description of each phase.

The effects are determined by analyzing the changes in the transportation environment that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. During the first high-flow season, the adit plug at Cape Horn Dam and the cofferdams at Cape Horn Dam would be removed simultaneously or in close sequence to flush sediment from the reservoirs, as described in Section 2.2. Final dam removal activities at the Scott Dam site would occur during the second low-flow season after sediment flushing (the first low-flow season after sediment flushing). The majority of removal activities at Cape Horn Dam would occur during the first low-flow season. Two alternate sequencing approaches to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: (1) If the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam; and (2) If Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1).

Final effects determinations consider measures (i.e., construction measures and post-facility removal measures) included to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential effects to the transportation network resulting from Project facility modifications were evaluated:

- Increased traffic on roads in the Transportation Study Area resulting from truck trips during construction;
- Increased traffic on roads in the Transportation Study Area resulting from worker transportation during construction; and
- Potential impacts related to emergency access.

During construction, vehicle miles traveled (VMT) would be generated from heavy trucks hauling materials to and from the Project Area and from worker commutes to and from the Project Area.

An increase in VMT on area roadways can increase congestion and cause delays by reducing intersection and roadway segment level of service (LOS), particularly in more developed regions that already experience traffic congestion. Detailed haul routes and construction worker numbers are not available at this time, and as a result, quantifying changes in VMT associated with Project construction activities cannot be determined. This analysis relies on best estimates of trip generation and qualitatively evaluates potential impacts related to traffic.

It is noted that the use of heavy construction vehicles, including haulers and large trucks, may accelerate the wear of roadways, including potholes, cracks, and uneven surfaces, and could lead to repairs being needed sooner than under the No-Action Alternative. Impacts related to roadway wear and maintenance are addressed in Section 3.4.1.9, Land Use.

Scott Dam Area

The decommissioning activities for Scott Dam and associated facilities were assumed to occur in three seasons: (1) initial low-flow season (June–October), (2) first high-flow season (November–May), and (3) first low-flow season after sediment flushing (June–October). Recreation facility and features removal is planned to occur simultaneously with the dam removal activities.

The roadways and trails that provide access to the Scott Dam Area are presented on Map 3.3.17-1. Bicycle trails and public transit stops do not extend into the Project Area. The Gravelly Valley Airport, north of Lake Pillsbury, provides access to the Scott Dam Area by air.

During the decommissioning of Scott Dam, public access to area roadways and trails may be limited during active construction activities.

Traffic from Truck Trips

During the removal of Scott Dam, haul truck activity would occur during the initial low-flow season (approximately 5 months) and the first low-flow season after sediment flushing (approximately 5 months). Under the Proposed Action, PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season. Removal of the adit plug and the first high-flow season activities will occur during the first wet season following the initial low-flow season, which may not occur immediately after the initial low-flow season.

During the initial low-flow season, 16,000 cubic yards[1] (CY) of material from the removal of the dam was estimated to be exported from the site. Assuming that each haul truck can accommodate a load volume of 16 CY, roughly 18 haul truck trips[2] would occur each day over the 5-month season. The most intensive haul truck activity would occur during the first low-flow season after sediment flushing, when up to 92,000 CY of material[3] would be exported from the site resulting in a maximum of 106 one-way truck trips[4] per day during this phase. Additional haul truck trips

[1] See Section 2.2.1.
[2] This is equal to 9 trips back and forth from the Project site, as haul trucks arrive empty and leave fully loaded.
[3] See Section 2.2.1.
[4] This is equal to 53 trips back and forth from the Project site, as haul trucks arrive empty and leave fully loaded.

would occur during decommissioning of recreation facilities. It is noted that haul trucks would also be used throughout the construction period to transport construction equipment, tools, water, and other ancillary materials to the site, as well as material removed associated with the decommissioning of the Project recreation facilities. These truck trips would be less frequent than the truck trips associated with a large volume of material export and would not result in a substantial impact. The following discussion considers conservative estimates to identify maximum potential effects.

In general, it is anticipated that haul truck traffic associated with the removal of Scott Dam and associated facilities would carry exported material along Upper Scott Dam Access Road, Scott Dam Road, Elk Mountain Road/County Road 301, and Highway 20 to Highway 101, southbound toward Ukiah, although other routes may be used. See Map 3.4.1.18-1 for the potential haul route evaluated in this discussion. As depicted therein, haul trucks would primarily use either private access roads or large collector roadways, and travel along public local streets would be limited to a short stretch along Elk Mountain Road prior to reaching Gage E2 Access Road (roughly 0.5 mile). Elk Mountain Road provides access the residences cited along Rice Fork Road. Upper Scott Dam Access Road and Scott Dam Road are Project roads that are exclusively used by PG&E, and access is limited by security gates. As a result, additional use of these roadways from truck trips during decommissioning of Scott Dam would not result in impacts to the public. However, Elk Mountain Road/Country Road 301 is a public road, operations of which may be affected by the Proposed Action.

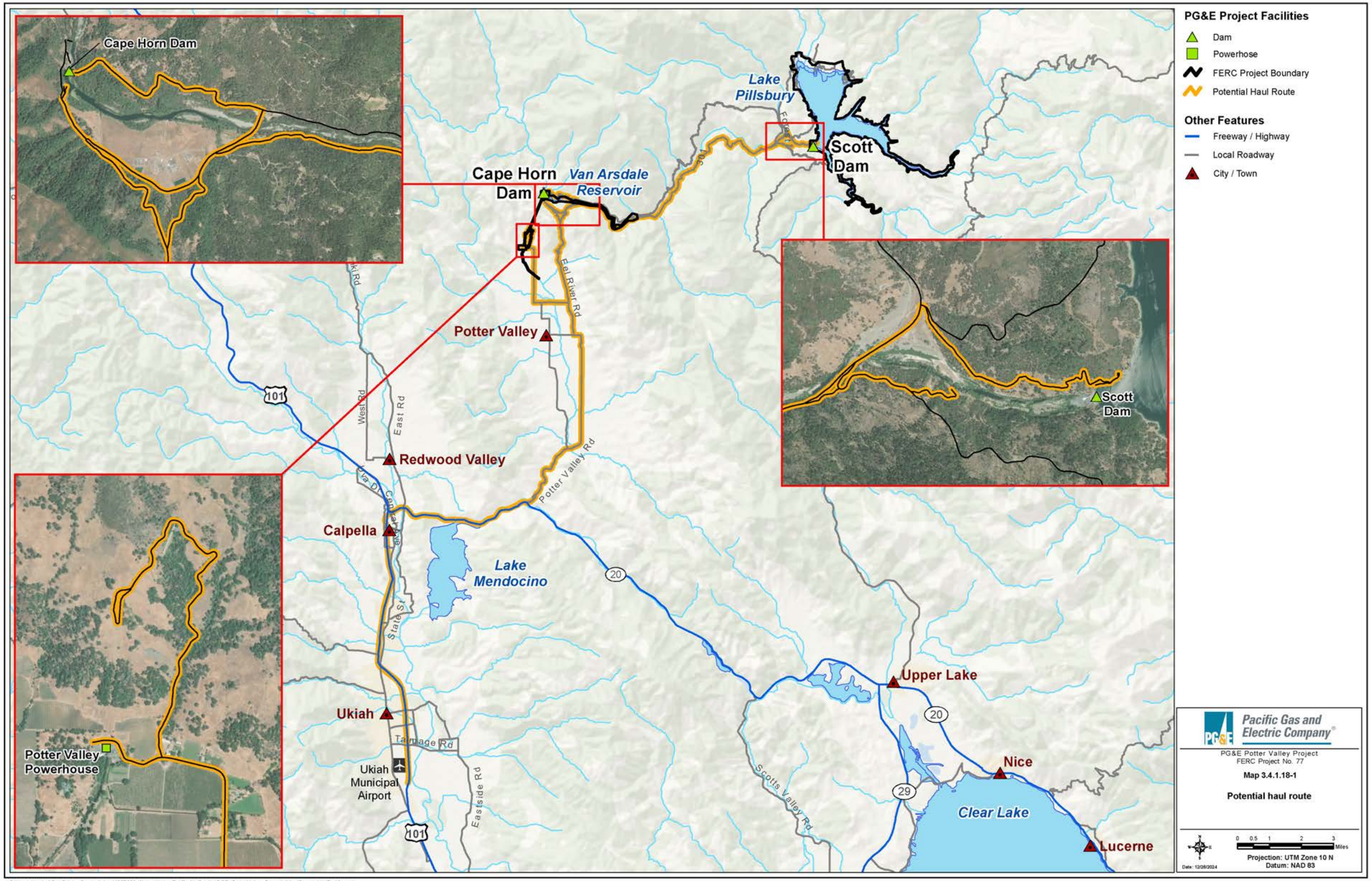
Under the Proposed Action, PG&E would implement General Construction Measures to minimize potential effects to the transportation network from truck trips. These measures include limiting construction activities to begin after sunrise (but no earlier than 7:00 a.m.) and end before sunset (but no later than 7:00 p.m.), limiting the speed of any vehicles and equipment traveling across unpaved areas to no more than 15 miles per hour, and ensuring that work occurs within identified staging areas. In addition, PG&E’s proposed Construction Transportation Management Plan will include measures to provide public notifications regarding planned road use by haul trucks and workers including the dates and times of construction, routes to be used by haul trucks, ensure that workers commute during off-peak hours, plans for any street or lane closures, and preservation of emergency vehicle access at all times, among other requirements.

Overall, with implementation of the General Construction Measures and Construction Transportation Management Plan (refer to Section 2.2.3) effects on traffic resulting from increased truck trips during construction are considered negligible. In addition, many of the roads used by trucks hauling material to and from the site would use either private, PG&E-owned access roads where the general public would not be affected, or highways where the addition of Project traffic would not be noticeable compared to existing traffic levels.

<u>Traffic from Worker Trips</u>

During construction, workers would commute to and from the Project Area each day. The majority of the worker traffic would occur during the initial low-flow season (approximately 5 months) and the first low-flow season after sediment flushing (approximately 5 months).

This Page Intentionally Left Blank



Map 3.4.1.18-1. Potential haul route.

This Page Intentionally Left Blank

Some worker traffic would also occur at the beginning of the first high-flow season (November–May) after the initial low-flow season for the detonation of the adit plug. As discussed above, PG&E would implement General Construction Measures to minimize potential effects to the transportation network. PG&E's proposed Construction Transportation Management Plan will also include several measures to minimize potential effects from increased traffic by workers arriving and leaving the construction site.

The total number of daily worker vehicle trips as a result of Project facility modifications is not anticipated to impact traffic in the Transportation Study Area since these workers would likely commute to and from the site during off-peak hours, as ensured by the Construction Transportation Management Plan. With implementation of the General Construction Measures and Construction Transportation Management Plan, impacts to traffic resulting from worker transportation during construction are considered negligible.

Emergency Access

This discussion considers potential effects of access to the Scott Dam Area by first responders as well as access to evacuation routes by residents of the greater Project Area. Map 3.3.17-4 identifies the primary access routes to the Scott Dam Area. Construction materials and equipment would be staged in areas that would not block emergency access or evacuation routes. The proposed Construction Transportation Management Plan would include a traffic control plan and a staging and haul route plan that would identify the primary emergency access routes, and ensure that the routes remain open throughout the entire construction period. Therefore, with implementation of the General Construction Measures and Construction Transportation Management Plan (refer to Section 2.2.3), effects to emergency access to the Scott Dam Area and access to evacuation routes by residents of the greater Project Area would be negligible.

Cape Horn Dam Area

Cape Horn Dam decommissioning would occur during the first low-flow season (approximately 5 months) and at the beginning of the first high-flow season (November–May) after the initial low-flow season for the removal of the cofferdams. No decommissioning activities are anticipated following first high-flow season.

The roadways and trails that provide access to the Cape Horn Dam Area are presented on Map 3.3.17-2. Bicycle trails and public transit stops do not extend into the Project Area. The Potter Valley Powerhouse Helicopter Landing Site is located adjacent to the Potter Valley Powerhouse.

Traffic from Truck Trips

See Map 3.4.1.18-1 for the potential haul route evaluated in this discussion. Haul truck travel along local streets would be limited to Powerhouse Road, which is also used to access rural residences in Potter Valley. However, trips along Powerhouse Road would be generated from travel to and from the Potter Valley Powerhouse, which would not include a substantial number of heavy duty truck trips due to the limited volume of material export associated with decommissioning the powerhouse.

The overall number of haul truck trips associated with decommissioning Cape Horn Dam would be less than those required for the removal of Scott Dam because the removal of Cape Horn Dam would entail less material export and would occur over a shorter construction season. While there would be an increase in truck trips during implementation of the Project, these trips would not noticeably increase traffic along the highway.

Haul trucks would also be used throughout the construction period to transport construction equipment, tools, water, and other ancillary materials. These truck trips are expected to be less frequent than the trips associated with material export and would not result in a substantial impact.

As discussed above, PG&E would implement General Construction Measures and the Construction Transportation Management Plan to minimize potential effects to the transportation network from truck trips. Overall, with implementation of these measures and the Construction Transportation Management Plan (refer to Section 2.2.3) effects on traffic resulting from increased truck trips during construction are considered negligible.

Traffic from Worker Trips

As noted above, during construction, workers would commute to and from the Project Area each day. The majority of the worker traffic would occur during the initial low-flow season. Some worker traffic would also occur at the beginning of the first high-flow season for the removal of the cofferdams. The total number of daily worker vehicle trips as a result of Project facility modifications would not be anticipated to create any noticeable impacts to traffic due to the relatively small number of workers (fewer than 23 staff per day) and use of roads during off-peak hours. With implementation of the General Construction Measures and Construction Transportation Management Plan, impacts to traffic resulting from worker transportation during construction at Cape Horn Dam are considered negligible.

Emergency Access

This discussion considers potential effects of access to the Cape Horn Dam Area by first responders as well as access to evacuation routes by residents of the greater Project Area. As discussed above, the Construction Transportation Management Plan will include measures to ensure that construction materials and equipment would be staged in areas that do not block emergency access or evacuation routes and the primary emergency access route (identified on Map 3.3.17-4) would remain open throughout the entire construction period. Therefore, with implementation of the General Construction Measures and Construction Transportation Management Plan (refer to Section 2.2.3), effects to emergency access to the Cape Horn Area and access to evacuation routes by residents of the greater Project Area would be negligible.

Eel River Watershed

The most significant roadway in the area is Highway 101. As of 2022, the segment of Highway 101 through the city of Willits experiences a maximum of 7,900 average daily vehicle trips (Caltrans 2024). The majority of traffic associated with the Proposed Action would occur south of the dams and would not affect the Eel River Watershed region.

Potential effects to bridges, road crossings, and roads in low-lying areas adjacent to the Eel River from reduced channel capacity due to sediment deposition following the removals of the dams are evaluated in Sections 3.4.1.8, Geomorphology, and 3.4.1.9, Land Use.

Russian River Watershed

Haul truck traffic and worker commutes are expected to primarily come from the south and, as a result, would affect roadways within the Russian River Watershed, including Highway 101. As of 2022, the segment of Highway 101 through Redwood Valley experiences a maximum of 24,000 average daily vehicle trips and the segment of Highway 20 immediately east of Redwood Valley experiences a maximum of 11,500 average daily vehicle trips (Caltrans 2024). Therefore, the addition of up to 106 one-way truck trips per day would represent between a 0.4 and 0.9 percent increase in traffic compared to existing conditions. This minor increase in daily traffic volume would not noticeably affect roadway LOS. Lake County has established a minimum standard of LOS C for county-maintained roadways. It is not expected that Project haul truck traffic would degrade operations of roadways in Lake County to below LOS C.

Phase 2: Post-facility Removal Effects

Phase 2 includes the immediate effects after removal of the dams (i.e., increase in sediment transport in the Eel River downstream of the dams) and restoration activities in the Project Area, including the Lake Pillsbury and Van Arsdale reservoir beds. Potential effects to traffic during Phase 2 compared to the No-Action Alternative (existing condition) were evaluated:

- Potential effects on the transportation network.

During Phase 2b, following facility removal, employee commutes to the sites may continue with implementation of the management plans until license termination; however, the trips would be fewer than would occur during Phase 1 construction and that which currently occurs under the No-Action Alternative for Project operation and maintenance.

Dam Removal Sequencing Options

Under the Proposed Action, PG&E would implement the initial low-flow season construction activities at Scott Dam and Cape Horn Dam the same year. There is the potential that Scott Dam could be removed and sediment flushed in a year prior to the removal of Cape Horn Dam or that Cape Horn Dam could be removed in a year prior to the removal of Scott Dam.

If the Scott Dam adit were removed and sediment flushed in a year prior to removal of Cape Horn Dam, mechanical removal of sediment behind Cape Horn Dam would be required and may extend the construction period. In addition, sediment would be released into the Eel River twice, and the Eel River in the vicinity of Cape Horn Dam may need to be dewatered twice.

If Cape Horn Dam was removed in a year prior Scott Dam, when Scott Dam is removed, sediment may bury or partially bury the NERF intake (assuming it was constructed at the same time as the Cape Horn Dam decommissioning). Additional construction may be required to remove sediment at the intake, and could be diverted to the East Branch Russian River via the NERF diversion. The duration of the construction period may be extended under this dam removal sequencing option.

In both dam removal sequencing options, the transportation network would be affected due to an increase in haul truck traffic and worker commute trips, regardless of which dam is removed first. Although the length of the construction period may vary depending on the dam removal sequencing option, the level of significance of the impact would not change. There would be no measurable difference in effects to traffic from the two sequencing options to the removal of Scott Dam and Cape Horn Dam.

Construction and Environmental Measures

To avoid or reduce effects to the transportation network during construction, PG&E will obtain, prepare, and/or implement the following measures and plan. A complete list of construction measures is included in Section 2.2.3.

- General Construction Measures.
- Construction Transportation Management Plan.

Unavoidable Adverse Effects

Unavoidable adverse impacts to the transportation network would not occur with implementation of the Proposed Action.

References

Caltrans (California Department of Transportation). 2024. Traffic Census Program, 2022 AADT. Available at: https://dot.ca.gov/programs/traffic-operations/census. Accessed April 2024.

TABLE OF CONTENTS

List of Tables

List of Acronyms

ºC	degrees Celsius
cfs	cubic feet per second
DO	dissolved oxygen
EFH	Essential Fish Habitat
mg/L	milligrams/liter
mi.	miles
PG&E	Pacific Gas and Electric Company
pH	power of hydrogen
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
USGS	U.S. Geological Survey

This Page Intentionally Left Blank

3.4.1.19 Marine Resources

This section describes the potential effects to marine resources that could occur because of the Proposed Action described in Pacific Gas and Electric Company's (PG&E's) Application for Surrender of License and Conceptual Decommissioning Plan for the Potter Valley Hydroelectric Project (Project) described in Section 2.2. Section 2.2 includes a description of decommissioning Project facility modifications, including restoration activities, to be implemented under the Proposed Action.

Potential effects are separated into construction effects (Phase 1) and post-facility removal effects (Phase 2). Post-facility removal effects are split into phases: Phase 2a – Initial Conditions and Preliminary Restoration and Phase 2b – Resulting Conditions and Restoration. Refer to Section 3.4.1 for a description of each phase.

The effects are determined by analyzing the potential changes to marine resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1). Analysis of the Proposed Action considers removal of Scott Dam and removal of Cape Horn Dam within the same construction season, as described in Section 2.2. In addition, potential dam removal sequencing options are qualitatively analyzed at the end of the Phase 1 – Short-term Construction Effects section. This includes analysis of the potential effects of (1) removal of Scott Dam prior to the removal of Cape Horn Dam in a year prior to the removal of Cape Horn Dam and (2) removal of Cape Horn Dam in a year prior to the removal of Scott Dam to provide flexibility in dam removal sequencing following completion of engineering design.

Final effects determinations consider construction measures and post-facility removal measures included to avoid or mitigate impacts associated with the Proposed Action (see Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Phase 1: Short-term Construction Effects

The following potential effects to marine resources resulting from short-term construction-related activities were evaluated:

- Potential effects of increased turbidity and suspended sediment during construction;
- Potential effects of pollutant spills of oil, fuel, or other toxic materials; and
- Potential effects of water contamination from stormwater or nutrient and bacterial runoff.

For the purposes of this section, the analysis area for marine resources is intertidal, tidal, and oceanic habitats between the mouth of the Eel River estuary and the nearshore region, limited to distance from shore and as illustrated in Map 3.3.18-1.

Potential Effects of Increased Turbidity or Suspended Sediment on Marine Resources

Construction activities at Scott Dam and Cape Horn Dam have the potential to temporarily impact water quality in the Eel River downstream of the dams. In addition, all Project recreation facilities (i.e., campgrounds and day-use areas) and associated access roads (which are all located in the Scott Dam Area) will be removed and the site will be restored. The exception is Trout Creek Campground and associated roads that are located near Cape Horn Dam and will be transferred to a third party. Because the recreational facilities are typically near Lake Pillsbury, there is a potential for water quality in the reservoir and downstream Eel River to be affected. As discussed in Section 3.4.1.3, Water Quality, these construction activities have the potential to cause a temporary increase in turbidity and suspended sediment in the Eel River downstream of the construction sites due to ground disturbance. Construction activities would disturb soils and make them susceptible to erosion. As a result, water quality may be potentially temporarily affected, reducing the quality of Essential Fish Habitat (EFH) (Section 3.3.18).

PG&E would implement water quality and erosion control measures to address and reduce the potential for increased suspended sediment loads and turbidity during construction activities. Construction measures include a Construction Site Water Diversion, Dewatering, and Drawdown Plan; a Construction Water Quality and Water Temperature Monitoring Plan; best management practices (BMPs); a Construction Erosion Prevention Plan; and an Estuary Protection Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With these measures, the potential for an increase in turbidity and suspended sediment and related water quality impacts to marine species and habitat in the Eel River estuary, nearshore, and ocean are considered negligible.

Potential Effects of Pollutant Spills on Marine Resources

Construction activities include the use of a variety of chemicals such as fuels, lubricants, paints, solvents, and construction materials. Improper handling, storage, or accidental spills of these chemicals could result in pollutants entering soil or surface water if not managed correctly. Activities associated with construction could increase the potential for accidental spills and pollutants to be introduced into the Eel River. This reduction in water quality could affect marine species and EFH by reducing habitat quality in the Eel River estuary, nearshore, and ocean.

To address and reduce the potential for pollutant spills, PG&E would implement construction-related BMPs to control spills; have emergency cleanup equipment readily available onsite; implement a Spill Prevention, Control, and Countermeasures (SPCC) Plan with protocols for preventing spills and managing incidents should they occur; and an Estuary Protection Plan. In addition, PG&E would obtain applicable resource agency and construction permits. With adherence to the above measures, potential effects to marine species and habitat in the Eel River estuary and nearshore region from pollutant spill contamination related to construction are reduced to a negligible level.

Potential Effects of Contamination from Stormwater or Nutrient and Bacterial Runoff on Marine Resources

Construction activities could temporarily alter natural drainage patterns. Without proper stormwater management practices such as silt fencing, straw/hay bales, or vegetative buffers, runoff from rainfall events could also transport pollutants from the construction site into the Eel River. Excess nutrients or bacteria (i.e., contaminants) could enter the Eel River if weather events coincide with the construction activity. This reduction in water quality could directly affect marine species and EFH by reducing habitat quality in the Eel River estuary, and nearshore region.

PG&E would implement water quality and erosion control measures at the construction activity locations described above. Construction measures include a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion Prevention Plan. Additionally, an Estuary Protection Plan would be implemented. PG&E would also obtain applicable resource agency and construction permits. With these measures, the potential for contamination from stormwater and nutrient/bacterial runoff and related water quality impacts to marine species and habitat in the Eel River estuary, nearshore, and ocean are considered negligible.

Phase 2: Post-facility Removal Effects

Phase 2 includes the initial, temporary physical conditions immediately following removal of the dams (Phase 2a) and Phase 2b that generally encompass the recovery phase of the decommissioning effort. Phase 2a conditions include those that may occur with the initial release of stored water and sediment following removal of the adit plug at Scott Dam and complete removal of Scott Dam and Cape Horn Dam (including cofferdam removal). During Phase 2b, Scott Dam and Cape Horn Dam will have been removed, Lake Pillsbury will have been dewatered, and restoration activities at these areas will have been initiated. The removal of the fish passage barrier (Scott Dam), improved fish passage at Cape Horn Dam, and re-establishment of unimpaired hydrology and natural sediment transport would result in an overall benefit to marine resources.

The following potential effects to marine resources associated with Project facility modifications from Phase 2a were evaluated and are described below:

- Direct effects from the short-term increased sediment load in the Eel River estuary and nearshore area immediately following dam removal;
- Direct effects through the short-term degradation of water quality, including toxins, nutrients, suspended solids, and pathogens, within the estuary and nearshore area that may be increased during the initial pulse release when the adit plug in Scott Dam is removed; and
- Indirect effects through the short-term degradation of water quality including algal blooms (increased chlorophyll α) and increased suspended solids, resulting in eutrophication and a reduction in dissolved oxygen (DO), power of hydrogen (pH) and alkalinity, and water temperature within the Eel River estuary, nearshore, and ocean.

The following direct and indirect effects to marine resources (including listed species) from Phase 2b resulting conditions and restoration beneficial effects include the following:

- Unimpaired hydrology would support the Eel River system connectivity from its source to the Eel River estuary, nearshore, and ocean.
- Unimpaired water quality and sediment processes would support Endangered Species Act–listed salmonid species' expanded habitat extent and their EFH within the Eel River estuary, nearshore, and ocean.

Direct Effects of Increased Sedimentation, Turbidity, and Suspended Solids

The Eel River estuary and nearshore area include habitat for species listed in Table 3.3.3-3 and EFH (Table 3.3.3-22). These species include finfish, all life stages of coastal pelagic species (Table 3.3.18-3), Pacific Coast groundfish (Table 3.3.18-4), highly migratory species (Table 3.3.18-5), coho (*Oncorhynchus kisutch*) and Chinook salmon (*Oncorhynchus tshawytscha*) (Table 3.3.18-6), steelhead (*Oncorhynchus mykiss*) (Table 3.3.18-2), anadromous and marine fish species (Table 3.3.18-2), sea turtles (Table 3.3.18-7), and marine mammals (Table 3.3.18-8) such as whales and sea lions. These species may be affected by changes to water quality parameters caused by Phase 2a actions, as outlined in Table 3.4.1.19-1 below.

Both direct and indirect effects can contribute to the reduction of quality or quantity of EFH and as such would be considered an adverse effect. "Adverse effect means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH" (NOAA Fisheries 2004). Per NOAA Fisheries' preceding definition, any potential changes directly and indirectly to water quality from toxins, DO, turbidity (chemical), or biomagnification from toxins (biological alteration), pH and alkalinity, and water temperature would qualify as adverse effects to EFH and require conservation measures as a result.

Table 3.4.1.19-1. Water quality parameters in the Eel River estuary and/or in nearshore areas potentially affected by the Proposed Action and with the potential to affect marine resources.

Water Quality Parameter	Description
Chlorophyll α	Measurements are used as proxy for primary productivity from phytoplankton presence, which forms the base of the food web, and directly estimate the amount of biomass, which helps to understand ecosystem health.
DO	Reduced levels of DO are often related to eutrophication and can cause die-offs of marine organisms.
Nutrients	Nitrogen and phosphorus are primary nutrients that affect the aquatic food web; nutrient enrichment (high nutrient levels) can trigger algal blooms.
Pathogens	Of concern are *Escherichia coli* and enterococci, both of which cause health risks to humans and fish that are common in coastal waters, and when levels become elevated, this can result in beach closures and fishing restrictions.

Water Quality Parameter	Description
pH and alkalinity	pH measures the concentration of hydrogen ions in solution that indicates how basic or acidic it is, while alkalinity measures the concentration of bicarbonate in solution, illustrating how resistant a solution is to a change in pH.
Suspended solids	Sediment particles or algae suspended in the water column can reduce light penetration. Deposition of solids can cover benthic habitat and change natural bathymetry.
Toxins	Stormwater runoff may input heavy metals and pesticides that can be harmful to aquatic organisms.
Turbidity	Reduced water clarity can reduce light penetration, leading to reduced primary productivity, and contribute to reduced DO. Reduced water clarity can also reduce predators' ability to find prey.

Direct effects from Phase 2a in the Eel River estuary, nearshore, and ocean areas include the potential for increased levels of sedimentation, turbidity, and suspended solids, toxins, pathogens, and nutrients, which could directly affect estuarine and marine species and decrease the quality of EFH. The fate of the initial pulse of sediment into the estuary, nearshore, and ocean would depend on riverine flows and tidal conditions at the time of dam removal. In addition, there is the potential that sediment from the dam removals could be deposited at the estuary mouth, reducing connectivity with the ocean.

Refer to Section 3.4.1.8 for a detailed evaluation of the potential Phase 2a effects to sediment conditions and Section 3.4.1.3 for a detailed evaluation of the potential Phase 2a effects to water quality downstream of the dams.

Eel River Estuary

Rapid dam removal would result in the flushing of a large volume of sediment downstream (approximately 21 million cubic yards of sediment [primarily silt and clay]) into the Eel River downstream of Scott Dam in a single high-flow season. The removal of the Scott Dam adit plug during dam removal would create a release flow of approximately 7,000 cubic feet per second (cfs) from Scott Dam. At Scott Dam, this is equivalent to approximately a 2-year event (impaired flow) (see Section 3.3.1). A 5-year event at Scott Dam is 16,500 cfs. At Scotia, the 2-year and 5-year events are 118,651 cfs and 205,066 cfs, respectively. Van Arsdale Reservoir is relatively small (originally 1,140 acre-feet) but contains approximately 1.7 million cubic yards of sediment (primarily coarser sediment) that could potentially be mobilized downstream of Cape Horn Dam following removal of cofferdams following dam removal. The coarser material would remain in the channel near / downstream of Cape Horn Dam. PG&E would schedule the adit blast at Scott Dam and the removal of the Cape Horn cofferdams during a period of high flows, which would minimize the duration of elevated suspended sediment to the extent possible. A large flush of fine sediments would travel down the Eel River from Scott Dam as washload (minimal deposition) along the entire Eel River to the ocean. A much smaller contribution to suspended sediments will be made by Cape Horn deconstruction.

Existing sediment modeling results indicate that most of the sand and coarse sediment that would be mobilized would be deposited upstream of the Middle Fork Eel River confluence, more than 120 miles (mi.) upstream of the mouth of the Eel River.

Sediment concentration measurements upstream of the estuary are available from 1959 to 1980 at U.S. Geological Survey (USGS) gage 1477000 Eel River at Scotia, approximately 150 mi. downstream from Scott Dam and approximately 7 mi. upstream of the confluence with the Van Duzen River. Typical daily sediment concentration in the winter months ranged from 2,500 to 8,000 milligrams per liter (mg/L) during this time period, with peaks greater than 10,000 mg/L during wetter years (USGS 2024b). Under existing conditions, the Upper Eel River subbasin contributes approximately 6 percent of the annual sediment load to the estuary, while the Middle Fork subbasin contributes 13 percent. The majority of sediment (68 percent) is derived from the mainstem of the Eel River between the South Fork Eel River and Middle Fork Eel River (Brown and Ritter 1971).

Suspended sediment concentrations would be elevated in the Eel River, including the estuary, and nearshore region to a lesser extent due to dam removal. As discussed in Section 3.4.1.3, modeling results indicate that initial maximum sediment concentrations immediately below Scott Dam with the draining of Lake Pillsbury would be significantly higher for 1 to 8 days following dam removal depending on the flow rates at the time of removal (see Table 3.4.1.3-1; for further discussion of potential effects to water quality). The concentrations from the dam removals would be expected to be diluted with downstream distance from the dams by the downstream inflows from large tributary streams, including from Tomki Creek, Outlet Creek, Middle Fork Eel River, North Fork Eel River, South Fork Eel River, and Van Duzen Rivers. As discussed in Section 3.4.1.4, modeled suspended sediment concentration at the estuary could still be extremely high (potentially 40,000 mg/L or higher at a 5,000 cfs release at the dam and assuming 12 million cubic yards of sediment is released) (see Figure 3.4.1.4-1), and would result in mortality and impaired function of salmonids and non-salmonids in the estuary (see Table 3.4.1.4-2).

As the highly turbid water travels down the Eel River to the mouth of the Eel River estuary, some suspended sediments could potentially settle out in the estuary. Deposited sediments would be remobilized with subsequent high-flow events, possibly over the course of several years, until they make their way out of the system. PG&E would implement the Estuary Protection Plan that would include water quality monitoring in the estuary prior to, during, and after the dam removals and monitor for potential sedimentation in the estuary that may occur from removal of the dams, as well as define a process for developing additional measures, if needed. In addition, the timing of the removal of the dams would be designed to minimize related potential impacts to sensitive species to the extent feasible.

In addition to modeling, sedimentation concentrations resulting from similar dam removal projects were reviewed to evaluate potential effects from the removal of Scott and Cape Horn dams (also see Section 3.4.1.8). The Klamath River dam removals are an example of a rapid dam removal approach, similar to the approach for Scott Dam in which water levels from the reservoirs were quickly drained through opening low-level gates or blasting tunnels near the base of the dams.

During the Klamath River dam removal project, the sediment concentration at Iron Gate Dam (USGS gage 11516530), the most downstream of the four dams that were removed, peaked at approximately 7,300 mg/L (USGS 2024a). This peak concentration was reduced by about 80 percent to approximately 1,600 mg/L by the river mouth (USGS gage 11530500) located about 122 mi. downstream and was within the range of sediment concentration experienced during historic high-river-flow events. Similar to the Klamath River dam removals, sediment concentrations from the removal of Scott and Cape Horn dams would be anticipated to be substantially reduced upstream of the estuary by tributary inputs and deposition.

Removing Scott Dam and Cape Horn Dam would have a short-term unavoidable adverse effect on suspended sediment and turbidity in the Eel River for a period of several days up to potentially several months, for which no mitigation is possible. This effect would extend along the entire length of the Eel River and Eel River estuary and into the nearshore region. In the long term, suspended sediment and turbidity would return to unimpaired conditions, with high-flow events transporting watershed-derived suspended sediment out into the ocean. PG&E would implement the Estuary Protection Plan that would include water quality monitoring in the estuary prior to, during, and after the dam removals and monitor for potential sedimentation in the estuary that may occur from removal of the dams, as well as define a process for developing additional measures, if needed. In addition, the timing of the removal of the dams would be designed to minimize related potential impacts to sensitive species to the extent feasible.

Nearshore Areas

As discussed above and in Section 3.4.1.8, high flows when the adit plug is removed would be expected to transport suspended fine sediment beyond the estuary and into the nearshore area following dam removal. The direction of plume travel would be dependent on incoming wave direction. During the winter/early-spring season when dam removal is scheduled to occur, coastal storms tend to originate from the south to produce northernly currents, and thus, the sediment plume may travel north toward Humboldt Bay. Studies have shown that sediment plumes tend to stay within the 130-foot-depth contour and that 40 to 75 percent of the sediment discharged by the Eel River settles out of the plume before reaching the entrance to Humboldt Bay (Geyer *et al.* 2000; Hill *et al.* 2000). The extent and direction of the sediment plume would likely be typical to what occurs during high-flow events that have been documented in the recent past (Geyer *et al.* 2000; Guerra *et al*. 2006). As a result, the sediment deposited in the nearshore region due to dam removal would likely be within the historic range of high-flow events, and therefore, the effects of removal on sediment loads in the nearshore areas are considered negligible.

Direct Effects of Increased Levels of Toxins, Nutrients, and Pathogens

Direct effects from Phase 2a in the Eel River estuary, nearshore, and ocean include the potential for increased levels of toxins, nutrients, and pathogens that could become suspended and reintroduced into the Eel River estuary and nearshore region as once-buried sediments in the reservoirs are exposed during dam removal (see Section 3.4.1.3), which could directly affect estuarine and marine species and decrease the quality of EFH.

Toxin, nutrient, and pathogen inputs could also occur as a result of stormwater runoff if agricultural land adjacent to the Eel River (e.g., in Scotia or Ferndale) were to become inundated from a storm event that occurred concurrent with the removal of the Scott Dam adit plug. Should sediment disturbance result in the resuspension of contaminants following dam removal, marine and estuarine species could be directly affected by exposure to excess nutrients (e.g., nitrogen and phosphorous) from fertilizer or livestock, toxins such as heavy metals, and pathogens. Increased nutrient levels can lead to the secondary effect of eutrophication, discussed in the subsequent section. Toxins can accumulate in the tissues of organisms. Filter feeders, such as molluscs, tend to accumulate toxins in higher concentrations than other macroinvertebrates, both because of their method of feeding and because of their sessile nature. Toxin accumulation also contributes to biomagnification as a secondary effect. Toxin accumulation can increase marine organisms' vulnerability to pathogens. Pathogens can directly affect marine organisms or their prey, leading to trophic imbalances. However, as described above, the removal of the Scott Dam adit plug would result in a flow release that would be within the historic range for this watershed. As a result, it is unlikely that adjacent agricultural land would become inundated and serve as a source of nutrients, toxins, or pathogens.

Post-drawdown of the reservoir, there is the potential for the reintroduction of toxins, nutrients, and pathogens in suspension from the reservoir sediments into the river system. However, it remains unlikely that marine and estuarine species would be exposed or directly affected by reintroduction of toxins, pathogens, and nutrients due to the flow releases anticipated to be within historical ranges and, therefore, is not expected to affect marine and estuarine species.

Indirect Effects

Removal of Scott Dam and Cape Horn Dam and the associated releases of trapped sediment from behind the dams have the potential to affect water quality parameters such as DO, nutrients, chlorophyll α, algal toxins, pH and alkalinity, and water temperature in the Eel River estuary, nearshore, and ocean.

<u>Dissolved Oxygen</u>

High suspended sediment concentrations are likely to result in impacts to DO downstream during Scott Dam removal while Lake Pillsbury is draining. The sediment is anoxic (lacking oxygen) and contains demands from both oxidation and biological consumption that would result in a period of low DO that could extend many miles downstream in the Eel River, likely down to the confluence with the Middle Fork Eel River (see Section 3.4.1.3).

Additionally, the upstream and downstream cofferdam removal at Cape Horn Dam would further decrease DO levels downstream in the Eel River, but this would be of shorter duration and smaller magnitude in comparison to the DO levels that would occur following dam removal. While specifics regarding the magnitude, extent, and duration are not known, water quality data from the Klamath River dam removal project and the sediment composition from Van Arsdale Reservoir basin can inform the potential effects of the removal of the cofferdam on downstream water quality conditions (see Section 3.4.1.3). As discussed in Section 3.4.1.3, the likely impact to DO from the release of sediments from behind the cofferdams would be moderate and would not pose a significant effect to fish or other aquatic organisms downstream.

As discussed above and in Section 3.4.1.3, DO would be expected to decrease downstream to the confluence of the Middle Fork Eel River and effects to DO following cofferdam removal would be less than would occur with the removal of the dams; therefore, effects are expected to be negligible on the Eel River estuary, nearshore, and ocean.

Nutrients, Chlorophyll α, and Algal Toxins

Addition of nutrients into the Eel River may result from sediment released from dam and cofferdam removal. The input of once-buried nutrients into the riverine and estuarine systems could trigger eutrophication as a secondary effect following dam removal. Nixon has defined eutrophication as "an increase in the rate of supply of organic matter to an ecosystem" (1995). Initially, nutrient enrichment can cause algal blooms, which result in increased turbidity, decreased light penetration, and increased water temperatures because suspended particles like algae absorb heat more readily than the surrounding water. Subsequently, decomposition of the algal bloom releases carbon dioxide, followed by reduced concentrations of DO.

Several toxic algal blooms have been observed in the Eel River Watershed (see Section 3.3.2and Section 3.4.1.3) that result from an excessive growth of algae (chlorophyll α). Recent measurements (Geosyntec 2020) indicated relatively high average concentrations of both total Kjeldahl nitrogen and total phosphorus in Lake Pillsbury sediments, which were typical of a eutrophic system with high nutrient concentrations (Marx *et al.* 1999). Van Arsdale Reservoir sediments had moderate total Kjeldahl nitrogen and total phosphorus concentrations but were significantly lower than those measured in Lake Pillsbury (Geosyntec 2020) (see Section 3.4.1.3).

PG&E would schedule the removal of Scott Dam during a time of high flows and low water temperature to minimize the potential short-term effects of increased nutrient loads in the Eel River to the extent possible. Algal blooms caused by high nutrient loads generally require warm, slow-moving water and therefore would be unlikely to occur during high-winter-flow periods, as most excess nutrients resulting from these releases would be flushed to the ocean before favorable conditions for algal blooms in the river could occur.

The removal of Scott Dam would have a negligible short-term effect on water quality in the Eel River estuary due to high nutrient levels, chlorophyll α, and algal toxins. It is possible that some sediment settling would occur along the Eel River that could potentially result in an increase in algal production in warm and low-flow conditions. As the nearshore region would ultimately receive these additional nutrients, chlorophyll α, and algal toxins, there is the potential for this short-term input to have a temporary effect from the delivery of nutrients and chlorophyll α adding to the upwelling processes and existing seasonal conditions with high nutrients.

pH and Alkalinity

Changes in both pH and alkalinity are possible due to the deconstruction of both Scott and Cape Horn dams. Data from the Klamath River dam removals indicate that potential impacts to pH would be expected to be relatively minor and of short duration downstream of the dams (see

Section 3.4.1.3). Similarly, alkalinity would also be expected to drop due to the release of large amounts of sediment from the reservoir, which can temporarily bind with available alkaline particles in the water, although these impacts are not expected to be of long duration.

As a result, the removal of Scott Dam and Cape Horn Dam is expected to have a negligible effect on pH and alkalinity in the Eel River estuary, nearshore, and ocean.

Water Temperature

The removal of Scott and Cape Horn dams would return the Eel River to unimpaired flows that would have a direct effect on water temperature in the river. It is estimated that temperatures in the Eel River at the E2 gage, about 0.5 mi. downstream of Scott Dam, could increase up to 8.5 degrees Celsius (ºC) from approximately May through the end of August compared to existing conditions under the No-Action Alternative and based on 2020–2023 data (see Section 3.4.1.3). Water temperatures at this location from September through January would be significantly cooler (up to 5°C) when compared to existing conditions. This would be a beneficial impact on water temperature compared to the No-Action Alternative within the Eel River but would negatively impact existing cold-water conditions during the spring and summer immediately below the dam (see discussion in Section 3.4.1.3). This change in water temperatures would only occur from Scott Dam downstream to approximately Cape Horn Dam (12 miles) and would not affect the estuary, nearshore, and ocean.

Direct and Indirect Effects on Listed Species

Direct and indirect effects on water quality can be particularly severe for species already experiencing population stressors, such as listed species and species that have designated critical habitat within the estuary, nearshore, and offshore areas, also including EFH within the estuary and nearshore areas. For this Project, these include coho, eulachon/smelt (*Thaleichthys pacificus*), green sturgeon (*Acipenser medirostris*), white sturgeon (*Acipenser transmontanus*), Chinook salmon, steelhead, humpback whale (*Megaptera novaeangliae*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), North Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*), southern resident killer whale (*Orcinus orca*), Guadalupe fur seal (*Arctocephalus townsendi*), Steller sea lion (*Eumetopias jubatus*), southern sea otter (*Enhydra lutris nereis*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), olive ridley sea turtle (*Lepidochelys olivacea*), and tidewater goby (*Eucyclogobius newberryi*). Additional species only listed under the California Endangered Species Act include the threatened longfin smelt (*Spirinchus thaleichthys*) (CNDDB 2024).

Species such as green and white sturgeon, sea otter, and octopus all feed on benthic molluscs, which may have a higher potential for exposure to toxins because their prey tends to accumulate toxins in higher concentrations than other macroinvertebrates. In addition, Chinook salmon, and other predatory species at the top of the trophic pyramid such as southern resident killer whale (and non-listed gray whale [*Eschrichtius robustus*]), are more likely to suffer from the effects of biomagnification, or the process by which toxins gradually accumulate in their bodies in levels higher than those found in the environment (Gray 2002). Toxin accumulation can lead to neurologic and physiological problems, reduced fecundity and low reproductive success, increased susceptibility to illness or injury, and reduced ability to navigate and find prey. Listed species may also be more vulnerable to introduced pathogens due to low genetic diversity or prior exposure to toxins.

Any indirect effects on water quality that change the primary productivity of estuarine and marine environments, such as reduced light, insufficient DO, or increased turbidity, could affect all organisms that rely on lower trophic levels. Listed species, such as southern resident killer whale, are particularly sensitive to reductions in prey availability stemming from decreased water quality, as they rely on salmon as their preferred primary prey. Hanson *et al.* (2021) discussed the well-documented summer diet of southern resident killer whale, primarily made of salmon, yet there are limited data on the three endangered southern resident killer whale pods' diet while they are in the outer coastal waters where they are likely to consume non-salmonid prey, such as halibut (*Hippoglossus stenolepis*) and lingcod (*Ophiodon elongatus*) , during winter and in drought years, or southern resident killer whale may potentially utilize other feeding areas within their range. As discussed in Section 3.4.1.4, the initial release of sediment and reduction of DO concentrations downstream of the reservoir would result in unavoidable, short-term adverse effects to salmonids and other fish and aquatic organisms, which could include mortality and impaired function. Salmon may be able to return relatively quickly to the Eel River. On the Klamath River, a single fall-run Chinook salmon was documented in a tributary upstream of J.C. Boyle Dam approximately two months after the dam was removed (Oregon Department of Fish and Wildlife 2024), illustrating the potential of how quickly salmon could return.

To minimize the potential adverse effects of short-term increases in suspended sediment on anadromous fish and other aquatic organisms, PG&E proposes to implement several measures, including a Water Diversion, Dewatering, and Drawdown Plan; a Sediment/Channel Monitoring and Response Plan; and a Construction Aquatic Species Management and Monitoring Plan. The Water Diversion, Dewatering, and Drawdown Plan would describe the timing and sequencing of drawdown and dam removal, which is designed to flush fine sediments from the historical river channel in the reservoir as rapidly as possible so that the duration of adverse effects on downstream biota (especially salmon) would be as limited as possible. PG&E's Water Diversion, Dewatering, and Drawdown Plan would time the drawdown and mobilization of sediments to coincide with seasonal high flows so that fine sediment would remain suspended as it passes through the lower Eel River and Eel River estuary to the Pacific Ocean. PG&E's Construction Aquatic Species Management and Monitoring Plan would include surveys and a rescue and relocation plan to reduce the effects of the Proposed Action on individual fish. PG&E also proposes to implement several measures during and after dam removal to address and reduce potential effects to aquatic habitat, sediment processes, and water quality, including the Sediment/Channel Monitoring and Response Plan, Estuary Protection Plan, and Restoration Plan, which will be beneficial to migratory fish in the Eel River, which are a food source for southern resident killer whale.

The potential effect from sediment loads on water quality in the estuary and nearshore areas would be anticipated to be temporary and limited to the period immediately following the flow release and restoration activities (Phase 2a) and, with implementation of the measures discussed above, would not rise to the level of adverse effects. Modeling results suggested that the majority of the fine sediment would be transported as washload without re-deposition once entrained by the flow and that the majority of the coarse sediment would be deposited upstream of the estuary (see Section 3.4.1.8). Water quality parameter effects including toxins, nutrients, suspended solids, and pathogens may occur; these effects are expected to be minor and temporary. Phase 2a will result in a large sediment pulse that would be attenuated with tributary inputs and is considered negligible.

Phase 2b of the Proposed Action includes post-dam removal restoration and the resulting restored hydrologic and geomorphic conditions in the watershed. The effects of Phase 2b are expected to be permanent and significantly beneficial to fish and aquatic resources in the Eel River Watershed, including the estuary and nearshore environments, in comparison to the No-Action Alternative.

Dam Removal Sequencing Options

Two alternate sequencing options to the removal of Scott Dam and Cape Horn Dam are qualitatively evaluated below: alternate sequencing 1, if the Scott Dam adit were removed and sediment flushed in a year prior to the removal of Cape Horn Dam, and alternate sequencing 2, if Cape Horn Dam were removed (including the cofferdams) in a year prior to the removal of Scott Dam (refer to Section 3.4.1.1). This is in contrast to the Proposed Action whereby PG&E would initiate removal of Scott Dam and Cape Horn Dam during the same low-flow season and remove the adit plug at Cape Horn Dam and the Cape Horn Dam cofferdams simultaneously or in close sequence to flush sediment from the reservoirs.

If Scott Dam were removed in a year prior to Cape Horn Dam, sediment would be deposited behind Cape Horn Dam and additional work would be needed to remove it prior to the removal of Cape Horn Dam inclusive of the fish passage. Sediment would be released into the Eel River twice, first with the removal of Scott Dam and second with the removal of the cofferdams at Cape Horn Dam. If Cape Horn Dam were removed in a year prior Scott Dam, sediment would also be released twice, once with the removal of Cape Horn Dam and the cofferdams, followed by the larger sediment release when Scott Dam is removed.

The dam removal sequencing options have the potential to affect the downstream river system by delivering sediment at different times and magnitudes. Under alternate sequencing 1, it is expected that the effects to water quality in the Eel River related to turbidity/suspended sediment, DO, water temperature, and other parameters from the removal of Scott Dam would be similar to the effects under the Proposed Action. In the Eel River downstream of Cape Horn Dam, the delayed removal of Cape Horn Dam would marginally reduce the effects of removing the two dams simultaneously in the first year. A marginal reduction would occur in the first year (when Scott Dam is removed) because some sediment (sand, suspended sediment) from Lake Pillsbury would be deposited behind Cape Horn Dam. As a result, suspended sediment concentrations downstream of Cape Horn Dam due to the removal of Scott Dam may be slightly reduced (Phase 2a effects) due to deposition of sediment at Van Arsdale Reservoir. Despite this marginal reduction, high turbidity would be expected to be observed below Van Arsdale Reservoir that would extend to the Eel River estuary. In a subsequent year, when Cape Horn Dam is removed, another flush of high turbidity/suspended sediment would be released into the Eel River. This would be a much smaller release of suspended sediment than would have been mobilized from behind Scott Dam. Alternate sequencing 1 would result in an extended period of elevated turbidity in the Eel River as a result of the staggered timing of the Scott Dam and Cape Horn Dam removals. It is expected during the first few years following release of sediment from Scott Dam and then to a lesser extent following the release from Cape Horn Dam that turbidity in the Eel River would be elevated as the reservoir beds are restored and sediments that settled out after the initial release are remobilized during subsequent high-flow events.

Under alternate sequencing 2 in which Cape Horn Dam is removed (including the cofferdams) prior to the removal of Scott Dam, the overall effect on water quality would be similar to the Proposed Action but would be split between two years, with a smaller effect in year one when Cape Horn Dam and associated cofferdams are removed and a much larger effect in a subsequent year when Scott Dam is removed, and effects to water quality would be similar to the effects under the Proposed Action. In the reach of Eel River between Scott Dam and Cape Horn Dam, the effects would be the same as under the Proposed Action. In the Eel River downstream of Cape Horn Dam, the previous removal of Cape Horn Dam would marginally reduce the effects of removing the two dams simultaneously. Despite this marginal reduction compared to the Proposed Action, high turbidity is expected to be observed below Van Arsdale Reservoir that would extend to the Eel River estuary. Alternate sequencing 2 would result in an extended period of elevated turbidity in the Eel River as a result of the staggered timing of the Scott Dam and Cape Horn Dam removals.

Construction and Environmental Measures

To avoid affecting marine species and EFH in the Eel River estuary, nearshore, and ocean during construction, the PG&E would obtain, prepare, and/or implement the following measures and plans. These measures and plans would be applied during implementation of the Proposed Action. A complete list of construction measures is included in Section 2.2.3.

- Construction Site Water Diversion, Dewatering, and Drawdown Plan
- Construction Water Quality Monitoring Plan
- BMPs
- Construction Erosion Prevention Plan
- Estuary Protection Plan
- SWPPP
- Hazardous Materials Handling Measures
  - SPCC Plan
  - Construction-related BMPs
  - Required compliance with applicable local, state, and federal standards associated with handling and disposal of hazardous materials

Construction also would include obtaining and implementing resource agency and construction permits; following water quality BMPs; and complying with local, state, and federal laws (e.g., Basin Plan water quality requirements):

- U.S. Army Corps of Engineers Section 404 Clean Water Act Permit
- State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification
- State Water Resources Control Board Construction General Permit/SWPPP

To avoid or reduce effects related to marine resources during Phase 2, PG&E will obtain, prepare, and/or implement the following measures and plans. A complete list of measures is included in Section 2.2.2.

- Post-dam Removal Aquatic Species Management and Monitoring Plan
- Estuary Protection Plan
- Restoration Plan
- Sediment/Channel Monitoring and Response Plan
- Water Diversion, Dewatering, and Drawdown Plan

Unavoidable Adverse Effects

There are short-term, temporary unavoidable adverse effects to water quality as a result of Project facility modifications to be implemented under the Proposed Action due to elevated suspended sediment concentrations that would extend along the entire length of the Eel River and Eel River estuary and into the ocean that may affect marine resources. The initial release of sediment and reduction of DO concentrations downstream of the reservoir could result in unavoidable, short-term adverse effects to salmonids and other fish and aquatic organisms in the estuary, which could include mortality and impaired function. In the long term, suspended sediment and turbidity would return to unimpaired conditions, with high-flow events transporting watershed-derived suspended sediment out to the ocean.

References

Brown, W., and J. Ritter. 1971. Sediment transport and turbidity in the Eel River basin, California. U.S. Geological Survey Water-Supply Paper 1986.

CNDDB (California Natural Diversity Database). 2024. Available at: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx. Accessed November 2024.

Geosyntec (Geosyntec Consultants, Inc.). 2020. Memorandum: Lake Pillsbury and Van Arsdale Reservoir Sediment Characterization. Prepared for California State Coastal Conservancy. April.

Geyer, W.R., P. Hill, T. Milligan, and P. Traykovski. 2000. The structure of the Eel River plume during floods. Continental Shelf Research 20: 2,067–2,093.

Gray, John S. 2002. Biomagnification in marine systems: the perspective of an ecologist. Marine Pollution Bulletin 45, nos. 1–12 (2002): 46–52.

Guerra, J.V., A.S. Ogston, and R.W. Sternberg. 2006. Winter variability of physical processes and sediment-transport events on the Eel River shelf, Northern California. Cont. Shelf Res.

Hanson, M. Bradley, Candice K. Emmons, Michael J. Ford, Meredith Everett, Kim Parsons, Linda K. Park, Jennifer Hempelmann, Donald M. Van Doornik, Gregory S. Schorr, Jeffrey K. Jacobsen, Mark F. Sears, Maya S. Sears, John G. Sneva, Robin W. Baird, and Lynne Barre. 2021. Endangered predators and endangered prey: Seasonal diet of Southern Resident killer whales. PLOS One 16, no. 3 (2021): e0247031.

Hill, P.S., T.G. Milligan, and W.R. Geyer. 2000. Controls on effective settling velocity of suspended sediment in the Eel River flood plume. Cont. Shelf Res. 20: 2,095–2,112.

Marx, E.S., J. Hart, and R.G. Stevens. 1999. Soil test interpretation guide: Oregon State University Extension Service, EC 1478, Corvallis, Oregon. 8 pp.

Nixon, S.W. 1995. Coastal marine eutrophication: a definition, social causes, and future concerns. Ophelia 41: 199–219.

NOAA Fisheries. 2004. Preparing Essential Fish Habitat Assessments: A Guide for Federal Action Agencies, Version 1, February 2004. Available at: https://media.fisheries.noaa.gov/dam-migration/efh_assessment_guidance_2004.pdf. Accessed November 2024.

Oregon Department of Fish and Wildlife. 2024. First salmon since 1912 spotted in Oregon's Klamath Basine months after dam removal. October 17, 2024. Available at: https://www.dfw.state.or.us/news/2024/10_Oct/101724.asp. Accessed November 2024.

Stillwater Sciences. 2021. Analyses and preliminary modeling of sediment transport following the proposed Scott Dam removal, Eel River, California. Technical Memorandum. Prepared for Two-Basin Solution Partners. November.

USGS (U.S. Geological Survey). 2024a. Water Data for the Nation – Klamath R AB Fall C NR Copco CA – 11511990. USGS. Available at: https://waterdata.usgs.gov/monitoring-location/11511990.

USGS (U.S. Geological Survey). 2024b. National Water Information System data available on the World Wide Web (USGS Water Data for the Nation). Accessed November 7, 2024, at: http://waterdata.usgs.gov/nwis/.

TABLE OF CONTENTS

List of Appendices

List of Tables

List of Acronyms

ac-ft	acre-feet
Cal Trout	California Trout
cfs	cubic foot/feet per second
CO_2e	carbon dioxide equivalent
DPS	Distinct Population Segment
ERPA	Eel-Russian Project Authority
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FYLF	foothill yellow-legged frog
GHG	greenhouse gas
LRMP	Land and Resource Management Plan
MNF	Mendocino National Forest
NERF	New Eel-Russian Facility
OHV	off-highway vehicle
PG&E	Pacific Gas and Electric Company
PVID	Potter Valley Irrigation District
RPA	Reasonable and Prudent Alternative
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency

3.4.2 Cumulative Effects

A cumulative effect is defined in this document to be the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

The section evaluates cumulative effects of Pacific Gas and Electric Company's (PG&E's) proposed decommissioning and restoration plans. The cumulative effects associated with the authorization for construction of the New Eel-Russian Facility (NERF) pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River, construction of a retaining wall and fill behind the retaining wall, and modification of the Potter Valley Powerhouse are evaluated in Section 3.5.2.

3.4.2.1 Cumulatively Affected Resources

The resources considered for the cumulative effects analysis of the Proposed Action were identified based on information contained in the Surrender Application and a review of technical information developed in support of this document.

For this analysis, resources that may be cumulatively affected by the incremental actions of the Proposed Action in combination with past, present, and reasonably foreseeable future actions include Water Use and Hydrology, Water Quality, Fish and Aquatic Resources, Botanical Resources, Wildlife Resources, Geology and Soils, Geomorphology, Land Use, Recreation Resources, Cultural Resources, Tribal Resources, Socioeconomic Resources, Noise, and Marine Resources. These are resources for which potential unavoidable effects from the Proposed Action under the Surrender Application were identified.

Additional information on these resources can be found in in Section 3.3 and Section 3.4.1 and the sections below.

3.4.2.2 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the Proposed Action's effects on resources when considering effects from other projects. These boundaries are defined to include the Proposed Action's effects on the resources. The geographic scope includes the Eel River upstream of Lake Pillsbury to the ocean and the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino.

3.4.2.3 Temporal Scope

The temporal scope of the cumulative effects analysis includes past, present, and reasonably foreseeable future actions and their possible cumulative effect on each resource listed above. The temporal scope for the cumulative effects analysis would be the time necessary for removal of the dams and restoration activities before the Federal Energy Regulatory Commission issues the license termination.

3.4.2.4 Past, Present, and Reasonably Foreseeable Actions

The action under consideration is PG&E's proposed decommissioning and restoration plans. Other actions considered in this cumulative effects section include the following:

- **Operation of the NERF to continue diverting water to the East Branch Russian River for use by the Eel-Russian Project Authority (ERPA).** Once completed, operation of the NERF will result in the long-term diversion of water from the Eel River into the East Branch Russian River. The proposed long-term operation of the NERF is described in Appendix 3.4.2-A. Diversions to the East Branch Russian River would be up to 300 cubic feet per second (cfs). Total monthly average diversions to the Potter Valley Irrigation District (PVID) would be up to 100 cfs under the Lower Limit Scenario and 150 cfs under the Upper Limit Scenario. Daily releases to the Eel River below the NERF would range from 70 percent to 100 percent of unimpaired flow. This is consistent with the concept for the previous Reasonable and Prudent Alternative minimum instream flow requirement for the Eel River below Cape Horn Dam, which generally required a release to the Eel River of 70 percent of unimpaired flow. Annual release volumes to the Eel River would range from 70 percent to 99 percent of unimpaired flow depending on the flow scenario.
- **Implementation of fisheries restoration activities identified in the Eel River Restoration and Conservation Plan (Cal Trout et al.** 2024). Phase 1 of the Eel River Restoration and Conservation Plan was finalized in June of 2024. The overarching goal of the plan is to build on existing restoration actions in the watershed, including the removal of Scott and Cape Horn dams. Specifically, the objective of the plan is to accomplish the following:

  > *"Guide substantial, collaborative, and long-term restoration and conservation actions to revitalize the Eel River and restore its fisheries. In addition, the Plan has been prepared to expand and coordinate efforts among those who are working on restoration and conservation efforts in the basin to have the greatest effect toward recovery of native anadromous fish populations. The Plan proposes a holistic approach to restoring and conserving the Eel River Watershed, with a particular focus on the river corridor."*

  The restoration and conservation program is intended to protect federally protected fish species in the watershed and aid in their recovery with a focus on fall-run California Coastal Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), Northern California Coastal steelhead (summer and winter run; *O. mykiss*), Pacific lamprey (*Entosphenus tridentatus)*, and green sturgeon (*Acipenser medirostris*) (Cal Trout *et al.*

2024). Phase 1 was focused on developing the program's vision, goals, and objectives; compiling existing data; selecting focal species; and developing a prioritization framework. Phase 2 of the plan will include developing an organizational structure, hiring staff, and implementing the prioritization process to determine actions needed to effectively and efficiently restore and conserve Eel River fish and aquatic resources. Phase 3 encompasses the implementation of restoration and conservation actions and a monitoring program to assess program effectiveness. Activities envisioned by the plan include but are not limited to restoring aquatic habitat connectivity, riverine habitat restoration, estuary habitat restoration, instream flow protection, improving water quality and water temperature, riparian and wetland habitat restoration, invasive species management, and sediment control (Cal Trout *et al.* 2024).

- **Development and implementation of Total Maximum Daily Loads (TMDLs) in the watershed (USEPA 2004, 2005, 2007).** As described in Section 3.3.2, water bodies in the Project Area listed as impaired by the U.S. Environmental Protection Agency (USEPA) under Section 303(d) of the Clean Water Act include the following:
  - Upper Eel River (temperature, sedimentation/siltation, and aluminum)
  - Lake Pillsbury (mercury)
  - Middle and lower main Eel River (temperature, sedimentation/siltation, and aluminum)
  - The Russian River Watershed, including the East Branch Russian River (sediment and temperature)
  - Lake Mendocino (mercury)

  The USEPA has developed water temperature and sediment TMDLs throughout the Eel River (USEPA 2004, 2005, 2007). The primary purpose of the TMDLs is so the State Water Resources Control Board can assure that beneficial uses of freshwater habitat (e.g., salmonid habitat) are protected from elevated levels of sediment and temperature and to address the declines of salmon and steelhead populations in the watershed (USEPA 2007). These TMDLs set the maximum levels of pollutants that the water body can receive without exceeding water quality standards for the Eel River basin. The TMDLs identify the following specific actions for limiting heat and sediment input into the Eel River (USEPA 2007):

  > *"For the temperature TMDLs, EPA recommends that protection or restoration of shade be evaluated in timber harvest permits on private lands to assure compliance with the TMDL shade allocations, and thus water quality standards. The State should also assure that the THP [Timber Harvest Plan] process is protecting natural shade.*
  >
  > *"For the sediment TMDL, EPA specifically recommends that more instream information be gathered in tributaries throughout the basin. Collecting this information, using a random sampling approach, would assist the Regional Board in determining if the reduced human-related sediment loading seen in the recent past is confirmed by instream conditions. Specific data collection recommendations include annual cross-sectional analyses in the lower Eel River*

main stem and Salt River, road assessment, and monitoring of restoration activities. Other sediment-associated implementation activities that would be helpful to watershed restoration include removal of sediment from the Salt River to restore flow, limit flooding, and restore fisheries; wetlands restoration; upgrading of deficient roads; and modification to restoration activities based on monitoring results."

- **Implementation of recovery actions for federally protected California Coastal Chinook salmon and the Northern California steelhead Distinct Population Segment (DPS) pursuant to the Coastal Multispecies Recovery Plan (NOAA 2016).** NOAA Fisheries finalized the Coastal Multispecies Recovery Plan in 2016 for California Coastal Chinook salmon and the Northern California steelhead DPS.[1] The recovery plan is intended to provide a framework for the conservation and survival of these species that focuses on and prioritizes threat abatement and restoration actions. NOAA Fisheries estimates recovery of the California Coastal Chinook salmon and the Northern California steelhead DPS may take 50 to 100 years (NOAA 2016). The goal of the recovery plan is to restore these species to sustainable levels so that they can be delisted and to restore freshwater and estuarine habitats to support self-sustaining, well-distributed, and naturally spawning populations (NOAA 2016).
  - Recovery objectives include the following:
    - Reducing the present or threatened destruction, modification, or curtailment of habitat or range;
    - Ameliorating utilization for commercial, recreational, scientific, or educational purposes;
    - Abating disease and predation;
    - Establishing the adequacy of existing regulatory mechanisms for protecting the Evolutionarily Significant Unit (ESU) and DPSs now and into the future (i.e., post-delisting);
    - Addressing other natural or humanmade factors affecting the continued existence of the ESU and DPSs; and
    - Ensuring the status of the ESU and DPSs are at a low risk of extinction (i.e., viable) based on abundance, growth rate, spatial structure, and diversity.
- **Eel River – Trout Creek and Alder Creek Land Acquisition, Potter Valley Tribe.** The Potter Valley Tribe received a donation of 879 acres of forested lands in the mainstem Eel River Watershed in January 2019. The Tribe negotiated a land conservation proposal with the Pacific Forest and Watershed Lands Stewardship Council, which was formed as part of a PG&E settlement agreement under the bankruptcy reorganization in 2003. Among the long-range future plans are "development of recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery

[1] The recovery plan also focused on the Central California Coast steelhead DPS, which does not occur in the Eel River.

resources, wildfire and fuels management, and becoming good neighbors with the stakeholders in the area" (Potter Valley Tribe 2025).

- **Continued management actions of the U.S. Forest Service – Mendocino National Forest (MNF) as guided by applicable land management planning documents, including its Land and Resource Management Plan (LRMP) (USFS-MNF 1995).** The LRMP includes goals, objectives, direction, and prescriptions used to guide land management activities within the MNF with respect to desired existing and future conditions. The Scott Dam Area, including Lake Pillsbury, is within the boundaries of the MNF. The Scott Dam Area lies within Management Area 11 (Lake Pillsbury). The LRMP contains management direction (see Section 3.3.8 for additional information), including the following:
  - Manage all bald eagle (*Haliaeetus leucocephalus*) sites as recommended in the Pacific Bald Eagle Recovery Plan and the Lake Pillsbury Bald Eagle Habitat Management Plan;
  - Analyze and coordinate the development, management, and use of the Lake Pillsbury basin;
  - Emphasize providing quality water-oriented recreation opportunities in a manner consistent with the protection of bald eagles;
  - Where applicable to National Forest System Lands, implement watershed improvements identified by the Lake Pillsbury Basin Sediment Task Force to control sediment inflow to Lake Pillsbury;
  - Emphasize stabilizing serpentine areas along the reservoir shoreline as well as the banks of the Eel River and the Rice Fork of the Eel River at their inlets to the reservoir to help reduce turbidity in the reservoir;
  - Reduce conflicts between off-highway vehicle (OHV) users and other recreationists through trail designation, administrative controls, and revision of the forest OHV plan;
  - Concentrate efforts to inform users about resource protection, fire prevention, and campground regulations. Prioritize law enforcement efforts in this area;
  - Analyze opportunities for the development of watchable wildlife areas and wildlife habitat interpretation for the public; and
  - Maintain the permit for a private resort on the reservoir for boat rentals, fuel, and so on. Continue to permit the summer home tract.

  As such, the LRMP is expected to continue to protect and maintain conditions on the lands managed by the MNF.

- **Climate change effects including potential reductions in snowpack, shifts in precipitation from snow to rain, earlier runoff, more frequent and intense storms, increased occurrence and severity of wildfires, and warming air temperatures.** These changes could alter the historical timing, magnitude, and quality of flows in the Eel River and East Branch Russian River watersheds, increase water temperatures, and reduce vegetation cover in high-burned areas that could result in increased sediment loading into waterways. Increased severity of wildfires due to climate change can also result in the loss of habitat for sensitive species and cultural and Tribal resources.

3.4.2.5 Cumulative Effects Analyses

The Proposed Action is expected to have short-term and resulting condition adverse effects on environmental, cultural, and Tribal resources. These effects are summarized in Volume I, Section 6. However, the Proposed Action along with implementation of other planned recovery activities in the watershed would result in significant, long-term, and beneficial cumulative effects to environmental and cultural resources in the Eel River and East Branch Russian River.

In the following sections, specific existing or foreseeable activities that may cumulatively affect environmental and cultural resources are described, and a summary of the cumulative effects of the Proposed Action along with other existing or foreseeable activities is provided.

Water Use and Hydrology

The Proposed Action removal of Scott Dam would restore unimpaired flows in the Eel River. With removal of Cape Horn Dam, diversions into the East Branch Russian River would cease and hydrology in the East Branch Russian River would become unimpaired. Unimpaired flow includes seasonally high flows when storm events occur, but the flows would be very low during the summer/fall season (e.g., 1 cfs) (see Section 3.3.1). Storage would be lost at Lake Pillsbury, and diversions to PVID from the Eel River would cease. The Proposed Action would have a long-term unavoidable adverse effect on PVID water supply and hydrology in the East Branch Russian River.

Other actions as described above in Section 3.4.2.4 in combination with the Proposed Action would result in an overall cumulative benefit to PVID water supply and hydrology in the East Branch Russian River.

NERF Diversions

- Sonoma Water provided hydrology modeling output of potential NERF diversions for water years 1911 through 2017. The modeling included an Upper and a Lower Limit Scenario for different flow locations (Appendix 3.4.2-A). The Sonoma Water modeling prioritizes meeting potential future minimum instream flow requirements in the Eel River before making diversions into the diversion tunnel. When water is available for diversion, there are constraints on diversions to PVID and diversions to the East Branch Russian River (see details in Appendix 3.4.2-A).

Construction of the NERF would allow continued diversion of Eel River water to PVID and the East Branch Russian River. The timing and monthly volume of water diverted would be altered compared to the existing conditions (Table 3.4.2-1). NERF diversions would depend on seasonal water availability of the unimpaired Eel River flows below the former Scott Dam. Under existing conditions, total diversions are fairly consistent throughout the year and average monthly flows historically ranged from 29 cfs to 64 cfs. The proposed total NERF diversions would more closely resemble the pattern of a natural hydrograph compared to the existing condition. Average monthly diversions in the drier months of July through October would be 1 cfs to 6 cfs and in the wetter months, December through April, would increase up to approximately 55 cfs to 120 cfs depending on the Upper or Lower Limit Scenario (Table 3.4.2-1). Total annual diversions to PVID would range from 3,000 acre-feet (ac-ft) to 7,700 ac-ft. This is well below the average diversion currently of approximately 35 cfs May 15 through September 15 (10,700 ac-ft). The total annual diversions to the East Branch Russian River would range from 24,800 ac-ft to 27,500 ac-ft, which is greater than existing conditions.

In the Eel River downstream of the NERF, the total annual average flow would decrease from 493,100 ac-ft per year under the unimpaired Proposed Action to 463,00 ac-ft per year (average of the Upper and Lower Limit scenarios) with the NERF, which is a decrease of 6.4 percent (see Table 3.4.2-1 and Table 3.4.2-A-1 in Appendix 3.4.2-A). On an average monthly basis, the NERF diversions would reduce the Eel River Proposed Action flows by 7 percent or less for the months of August through March and 12 percent to 18 percent in the months of April through July.

The NERF diversion would increase flows to PVID and the East Branch Russian River while maintaining protection of flow in the Eel River below the NERF. Diversion amounts to PVID would be below PVID’s current diversions, and summer flows in the East Branch Russian River would still be very low during the summer/fall season (e.g., 1 cfs). The NERF diversion operations and the Proposed Action, however, would be a cumulative benefit to PVID water supply and long-term hydrology in the East Branch Russian River and be protective of flows in the Eel River.

Other Actions

- The Eel River Restoration and Conservation Plan identifies several potential activities that would be implemented, including those that would benefit Eel River flows, such as riparian and wetland restoration and instream flow protection. Implementation of the Eel River Restoration and Conservation Plan and Proposed Action would result in a neutral to beneficial cumulative effect on water use and hydrology in the Eel River.
- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would include some measure of watershed protection/restoration. Implementation of TMDLs and the Proposed Action would result in a long-term cumulative benefit to hydrology resources in the Eel and East Branch Russian rivers.
- Implementation of the Coastal Multispecies Recovery Plan (NOAA 2016) restoration activities in the watershed may benefit natural hydrology in the Eel River. Therefore,

implementation of NOAA Fisheries' Coastal Multispecies Recovery Plan and the Proposed Action would have neutral to beneficial cumulative effects on hydrology in the Eel River.

- The Potter Valley Tribe Trout Creek and Alder Creek land acquisition and proposed activities (recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, wildfire and fuels management) would likely result in neutral to beneficial cumulative effects to water use and hydrology in the Eel River compared to the Proposed Action.
- The MNF forest management and watershed protection and limiting of activities within riparian areas to maintain riparian resources and channel conditions and to prevent degradation of riparian corridors and streams, in combination with the Proposed Action, are expected to have a cumulative beneficial effect on water use and hydrology in the Eel River.
- Climate change effects, including potential reductions in snowpack, shifts in precipitation from snow to rain, earlier runoff, more frequent and intense storms, increased occurrence and severity of wildfires, and warming air temperatures. These changes could alter the historical timing, magnitude, and quality of flows in Eel River Watershed. The Proposed Action restores unimpaired flow conditions in the Eel River and East Branch Russian River. The combination of climate change and the Proposed Action would be a cumulative adverse effect on the water supply and hydrology in the East Branch Russian River. With construction of the NERF (discussed above), however, the overall effect to water use and hydrology in the East Branch Russian River would be cumulatively beneficial.

Water Quality

The Proposed Action removal of Scott Dam would restore unimpaired flow and sediment conditions in the Eel River. With removal of Cape Horn Dam, diversions into the East Branch Russian River would cease and hydrology in the East Branch Russian River would become unimpaired. The Proposed Action unimpaired flow conditions would result in adverse effects to water quality by increasing spring and summer water temperature in the Eel River from below Scott Dam to below Cape Horn Dam a few miles and increase spring and summer water temperatures in the East Branch Russian River compared to existing conditions. As a result, the Proposed Action would have a long-term unavoidable adverse effect on water temperature in the Eel River and the East Branch Russian River.

Other actions described above in Section 3.4.2.4, in combination with the Proposed Action, would result in an overall cumulative benefit to water temperature and water quality in the Eel River and East Branch Russian River.

Table 3.4.2-1. Monthly average flows diverted to the Potter Valley Irrigation District and East Branch Russian River and total flow diversions and total flow in the Eel River below Cape Horn Dam/the NERF under existing conditions (No-Action), the Proposed Action, and the NERF Upper and Lower Limit scenarios (1911–2017).

	Diversions to Potter Valley Irrigation District (cfs)				Diversions to East Branch Russian River (cfs)				Total Diverted Flows (cfs)				Eel River (cfs)			
Month	Existing Conditions (No-Action)[1]	Proposed Action	Upper Limit Scenario	Lower Limit Scenario	Existing Conditions (No-Action)[1]	Proposed Action	Upper Limit Scenario	Lower Limit Scenario	Existing Conditions (No-Action)[1]	Proposed Action	Upper Limit Scenario	Lower Limit Scenario	Existing Conditions (No-Action)[1]	Proposed Action	Upper Limit Scenario	Lower Limit Scenario
Oct.	19	0	0	0	39	0	1	1	58	0	1	1	54	60	59	59
Nov.	5	0	7	7	39	0	15	14	44	0	22	21	238	333	311	313
Dec.	5	0	31	18	39	0	40	37	44	0	71	55	1,004	1,153	1,082	1,098
Jan.	5	0	43	15	27	0	45	40	29	0	88	55	1,624	1,739	1,651	1,684
Feb.	5	0	30	8	33	0	48	31	39	0	78	39	1,808	1,907	1,829	1,868
Mar.	5	0	13	2	38	0	73	110	43	0	86	112	1,376	1,439	1,353	1,328
Apr.	21	0	4	0	34	0	93	120	55	0	97	120	885	943	846	823
May	35	0	1	0	29	0	59	67	64	0	60	67	395	438	378	372
June	35	0	0	0	25	0	28	28	60	0	28	28	106	156	129	128
July	35	0	0	0	10	0	6	6	45	0	6	6	30	44	38	38
Aug.	35	0	0	0	10	0	1	1	45	0	1	1	25	19	18	18
Sep.	35	0	0	0	10	0	1	1	45	0	1	1	24	20	19	19
Total (ac-ft)	**14,500**	**0**	**7,700**	**3,000**	**20,100**	**0**	**24,800**	**27,500**	**34,500**	**0**	**32,400**	**30,500**	**452,200**	**493,100**	**462,000**	**464,000**

[1] 1912–2023 period of record (see Section 3.3.1)

NERF Diversions

- As discussed in the Water Use and Hydrology section above, operation of the NERF would result in diversion of Eel River water to the East Branch Russian River following removal of Cape Horn Dam and Lake Pillsbury storage. The timing and monthly volume of water diverted would be altered compared to existing conditions (Table 3.4.2-1). The NERF diversions would depend on seasonal water availability of the unimpaired Eel River and maintaining protection of flow in the Eel River below the NERF. The proposed NERF diversions would more closely resemble the pattern of a natural hydrograph compared to the existing condition. Average monthly diversions in the drier months, July through October, would be low, 1 cfs to 6 cfs, and in the wetter months, December through April, would increase up to 55 cfs to 120 cfs (depending on the Upper or Lower Limit Scenario) (Table 3.4.2-1). The low summer diversion would provide limited direct surface flow to the East Branch Russian River, but it is anticipated that the earlier season flows would help maintain groundwater levels and result in some level of groundwater inflow to the East Branch Russian River in the summer/fall. In combination with the Proposed Action, the NERF diversions would be a cumulative benefit to water temperature and water quality in the East Branch Russian River and a neutral cumulative effect to water temperature and water quality in the Eel River.

Other Actions

- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would involve activities to manage and improve water quality, including water temperature, sediment, and aluminum. Removing Scott Dam and Cape Horn Dam under the Proposed Action would release reservoir sediments downstream. However, in the long term, unimpaired hydrology and natural sediment transport processes would re-establish a natural channel and a new natural suspended sediment and turbidity regime. The release of the reservoir sediment would temporarily adversely impact the objectives of the TMDLs at reducing sediment levels. Currently, Lake Pillsbury is trapping much of the sediment produced in the upper Eel River Watershed. Although the removal of the dams would not increase the long-term volume of sediment delivered from the upper watershed, sediment that is currently being trapped in the reservoirs would be transported down the Eel River. The new (natural) suspended sediment and turbidity regime may increase baseline sediment loads used in the TMDLs developed for the middle and lower main Eel River. The Proposed Action would also result in a new natural water temperature regime in the Eel and East Branch Russian rivers. This water temperature regime would be higher in the summer due to lower (unimpaired) summer flows below Scott Dam and in the East Branch Russian River. The TMDLs in addition to the Proposed Action would cumulatively reduce elevated levels of water temperature and sediment, but the baseline sediment and water temperature conditions would be higher than under current conditions.
- Implementation of the fisheries restoration plans and projects identified in the Eel River Restoration and Conservation Plan would include activities to improve water quality and water temperature, restore riverine and estuary habitats, and control sediment entering

waterways. Implementation of these plans would result in a neutral to beneficial cumulative effect on water quality compared to the Proposed Action.

- The Potter Valley Tribe acquired approximately 879 acres of forested lands in the Eel River Watershed under the Eel River – Trout Creek and Alder Creek Land Acquisition. Future plans associated with this acquisition include assisting with restoration of habitat and fisheries resources and wildfire and fuels management. Therefore, in combination with the Proposed Action, this land acquisition would likely result in neutral to beneficial cumulative effects to water quality.
- The MNF forest management and watershed protection and limiting of activities within riparian areas (to maintain riparian resources, improve channel conditions, and prevent degradation of riparian corridors and streams), in combination with the Proposed Action, are expected to have a cumulative benefit to water quality in the Eel River.
- Climate change effects to the Eel River Watershed include potential reductions in snowpack, shifts in precipitation from snow to rain, earlier runoff, more frequent and intense storms, increased occurrence and severity of wildfires, and warming air temperatures. These changes could alter the historical timing, magnitude, and quality of flows in the Eel River Watershed, increase water temperatures, and reduce vegetation cover in high-burned areas that could result in increased sediment loading into waterways. Climate change effects in combination with the Proposed Action are expected to have an unavoidable cumulative adverse effect on water temperature in the Eel River and East Branch Russian River.

Fish and Aquatic Resources

The Proposed Action removal of Scott Dam would restore fish passage for Endangered Species Act (ESA)–listed Chinook salmon and steelhead, other special-status species, and native species into the Eel River Watershed headwaters (50+ miles of spawning and rearing habitat). Removal of Cape Horn Dam would provide anadromous fish unconstrained passage to the mainstem upper Eel River and tributaries. Removal of Cape Horn Dam, however, would cease water diversions into the East Branch Russian River. This would result long-term direct loss of special-status species (foothill yellow-legged frog [FYLF], northwestern pond turtle, western pearlshell mussels), which would be an unavoidable adverse effect on fish and aquatic resources in the East Branch Russian River (Section 3.4.1.4).

Other actions (Section 3.4.2.4) in combination with the Proposed Action would result in an overall cumulative benefit to fish and aquatic resources in the Eel River and East Branch Russian River.

NERF Diversions

- Construction of the NERF would allow continued diversion of Eel River water to the East Branch Russian River following removal of Cape Horn Dam and Lake Pillsbury storage. The timing and monthly volume of water diverted would be altered compared to existing conditions (Table 3.4.2-1). The NERF diversions would depend on seasonal water availability of the unimpaired Eel River flows and maintaining protection of flow in the

Eel River below the NERF. The proposed total NERF diversions would more closely resemble the pattern of a natural hydrograph compared to the existing condition. Average monthly diversions in the drier months of July through October would be low, 1 cfs to 6 cfs, and in the wetter months of December through April would increase up to approximately 55 cfs to 120 cfs depending on the Upper or Lower Limit Scenario (Table 3.4.2-1). The low summer diversion would provide limited direct surface flow to the East Branch Russian River, but it is anticipated that the earlier season flows would help maintain groundwater levels and result in some level of groundwater inflow to the East Branch Russian River in the summer/fall. In combination with the Proposed Action, the NERF diversions would be a cumulative benefit to hydrology in the East Branch Russian River and would be a cumulative benefit to special-status species (FYLF, northwestern pond turtle, western pearlshell mussels).

Other Actions

- The overarching goal of the Eel River Restoration Plan is to build on existing restoration actions in the watershed, including the removal of Scott and Cape Horn dams. The restoration and conservation program is intended to protect federally protected fish species in the watershed and aid in their recovery with a focus on fall-run California Coastal Chinook salmon, coho salmon, Northern California Coastal steelhead (summer and winter run), Pacific lamprey, and green sturgeon (Cal Trout et al. 2024). Implementation of the Eel River Restoration and Conservation Plan would result in a beneficial cumulative effect on fish and aquatic resources compared to the Proposed Action.
- Development and implementation of TMDLs in the watershed, including the upper Eel River (temperature, sedimentation/siltation, and aluminum), middle and lower main Eel River (temperature, sedimentation/siltation, and aluminum), and Russian River Watershed including the East Branch Russian River (sediment and temperature), would improve habitat conditions in the Eel and East Branch Russian rivers. Implementation of the TMDLs in combination with the Proposed Action will result in a beneficial cumulative effect on fish and aquatic resources.
- Recovery actions in the Coastal Multispecies Recovery Plan for federally protected Chinook salmon and steelhead include reducing threats to habitat, abating disease and predation, and addressing regulatory mechanism for protecting the species. The recovery plan is intended to provide a framework for the conservation and survival of these species. Implementation of the Proposed Action and the Coastal Multispecies Recovery Plan would result in a beneficial cumulative effect on fish and aquatic resources.
- The Potter Valley Tribe acquisition of approximately 879 acres of forested lands in the Eel River watershed (Trout Creek and Alder Creek Land Acquisition) would include development of recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, and wildfire and fuels management. These activities in combination with the Proposed Action would result in beneficial cumulative effects to fish and aquatic resources.

- MNF continued forest management, watershed protection, and limiting of activities within riparian areas to maintain riparian resources and channel conditions and to prevent degradation of riparian corridors and streams, in combination with the Proposed Action, are expected to have a cumulative benefit to fish and aquatic species in the Eel River.
- Climate change could alter the historical timing, magnitude, and quality of flows in the Eel River Watershed, increase water temperatures, and reduce vegetation cover in high-burned areas that could result in increased sediment loading into waterways. The Proposed Action increases access into the headwaters of the Eel River upstream of Lake Pillsbury and increases passage by removing Cape Horn Dam. These actions are expected to increase resiliency of the fish populations. The Proposed Action would provide a cumulative benefit to fish and aquatic species related to climate change effects.

Botanical Resources

The Proposed Action may result in potential temporary short-term adverse effects to eelgrass (*Zostera* spp.) communities in the Eel River estuary from suspended fine sediment loads and alteration of riparian and wetland habitat along the East Branch Russian River (Section 3.4.1.5). In the long term, the Proposed Action would remove Scott and Cape Horn dams and restore unimpaired hydrology and sediment supply/transport in the Eel River. Diversions from the Eel River to the East Branch Russian River would cease. Summer flows would be much lower, but high-flow events would still occur seasonally as a result of storm events. The East Branch Russian River channel would adjust in geomorphic form to a condition more similar to its unimpaired, natural condition prior to receiving increased flows from Eel River diversions.

Other actions in combination with the Proposed Action would result in an overall cumulative benefit to botanical resources (botanical, riparian, and wetland resources).

NERF Diversions

- As discussed in the Water Use and Hydrology section above, operation of the NERF would result in diversions to the East Branch Russian River. Flow would be diverted during November–June. Average monthly total diversions from the Eel River to the East Branch Russian River would be between 1 cfs (August–October) and 110–120 cfs (March–April; Lower Limit Scenario). In combination with the Proposed Action, operation of the NERF would increase diversions for riparian and wetland habitats and aquatic special-status plants along the East Branch Russian River. This increase in flows, as compared to the Proposed Action, would cumulatively benefit botanical resources (special-status plants, riparian habitats, and wetlands) in the East Branch Russian River.

Other Actions

- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds over the long term would reduce elevated levels of sediment and pollutants and result in an overall cumulative benefit to water quality for aquatic special-status plant species and wetland and riparian habitat.

- The Potter Valley Tribe acquired approximately 879 acres of forested lands in the Eel River Watershed under the Eel River – Trout Creek and Alder Creek Land Acquisition. Long-term plans under this acquisition that could cumulatively affect botanical resources include development of recreation facilities, expanding environmental education programs, restoration of habitat and fishery resources, and wildfire and fuels management. The cumulative impact on botanical resources depends on the exact nature of the activities. Construction of additional recreational facilities could alter habitats for special-status plants. Expanding environmental education programs may help protect sensitive botanical resources and promote conservation activities. Wildfire and fuels management may reduce stand-replacing fire risks, which could benefit special-status plant species that depend on forested habitats. Therefore, in combination with the Proposed Action, this land acquisition and proposed activities would likely result in neutral to beneficial cumulative effects to botanical resources.
- Management of threatened, endangered, and sensitive plant resources and riparian and aquatic ecosystems in the MNF would continue to occur under the LRMP (USFS-MNF 1995). The LRMP establishes survey and monitoring guidelines and defines management activities to benefit threatened, endangered, and sensitive plant resources. The LRMP also limits management activities within riparian reserves (buffers around different types of aquatic habitats) to maintain riparian resources, channel conditions, and fish passage and to prevent and mitigate degradation of riparian habitat. In combination with the Proposed Action, continued implementation of management activities under the LRMP would benefit botanical resources and riparian and wetland habitats on MNF lands.

Wildlife Resources

The Proposed Action may result in potential adverse effects to bald eagles, northern spotted owls (*Strix occidentalis caurina*), other raptors including osprey (*Pandion haliaetus*), other special-status birds or game birds, special-status mesocarnivores, and tule elk (*Cervus canadensis nannodes*) and other game mammals (Section 3.4.1.6). In the long term, the Proposed Action would remove Scott and Cape Horn dams and restore unimpaired hydrology and sediment supply/transport in the Eel River. Diversions from the Eel River to the East Branch Russian River would cease. Summer flows would be much lower, but high-flow events would still occur seasonally as a result of storm events. The East Branch Russian River channel would adjust in geomorphic form to a condition more similar to its unimpaired, natural condition prior to receiving increased flows from Eel River diversions.

Other actions in combination with the Proposed Action would result in an overall cumulative benefit to wildlife resources (including threatened and endangered species).

NERF Diversions

- As discussed in the Water Use and Hydrology and Botanical Resources sections above, operation of the NERF would result in diversions to the East Branch Russian River. As compared to the Proposed Action, operation of the NERF would increase diversions to the East Branch Russian River for riparian and wetland habitats that provide suitable habitat for a variety of wildlife species. In combination with the Proposed Action, increased diversions to the East Branch Russian River may cumulatively benefit bald eagle, osprey, and other special-status raptor foraging habitat; tricolored blackbird (*Agelaius tricolor*) irrigated agricultural nesting habitats; special-status bat foraging habitat; and tule elk and other game mammal foraging habitat.

Other Actions

- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would reduce elevated levels of sediment and pollutants and result in an overall cumulative benefit to water quality in the long term for aquatic foraging species such as bald eagle, osprey, and special-status bats.
- Implementation of the fisheries restoration plans and projects identified in the Eel River Restoration and Conservation Plan would protect federally listed fish species within the watershed and aid in the recovery of anadromous fish populations. Additionally, implementation of recovery actions under NOAA Fisheries' Coastal Multispecies Recovery Plan would address current population threats for listed species and restoration of spawning habitats within the Eel River Watershed, with the goal of enhancing self-sustaining and naturally spawning steelhead and salmon populations. The Proposed Action will have short-term and significant adverse effects on fish resources during the construction phase; however, removal of a barrier to fish passage on the Eel River (Scott Dam) and access to habitat in the Eel River Watershed upstream of Lake Pillsbury would result in long-term benefits to fish populations. Implementation of the Eel River Restoration and Conservation Plan, NOAA Fisheries' Coastal Multispecies Recovery Plan, and the Proposed Action would result in beneficial, long-term cumulative effects on fish and aquatic resources. Healthier fish populations, in turn, would benefit foraging habitat for fish-eating wildlife species such as bald eagle and osprey.
- The Potter Valley Tribe acquired approximately 879 acres of forested lands in the Eel River Watershed under the Eel River – Trout Creek and Alder Creek Land Acquisition. Long-term plans under this acquisition that could cumulatively affect wildlife resources include development of recreation facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, and wildfire and fuels management. The cumulative impact on wildlife depends on the exact nature of the activities. Construction of additional recreational facilities could increase human disturbance pressure or alter wildlife habitats. Expanding environmental education programs may help protect sensitive wildlife resources and promote conservation activities. Restoration of fisheries may enhance foraging opportunities for fish-eating wildlife such as bald eagle and osprey. Wildfire and fuels management may reduce stand-replacing fire risks, which could benefit closed-canopy forest species such as northern spotted owl (*Strix occidentalis caurina*), fisher (*Pekania pennanti*), and marten (*Martes americana*). Therefore, in combination with the Proposed Action, this land acquisition would likely result in neutral to beneficial cumulative effects to wildlife resources.

- Management of wildlife resources (including threatened, endangered, and sensitive species) in the MNF would continue to occur under the LRMP (USFS-MNF 1995). The LRMP establishes monitoring guidelines and defines survey guidelines and management directives to benefit wildlife species, including bald eagle, osprey, American peregrine falcon (*Falco peregrinus*), northern spotted owl, northern (American) goshawk (*Astur atricapillus*), special-status bats species, and tule elk. The LRMP also defines management activities within wildlife habitats to promote important habitat elements such as snags, coarse woody debris, and hardwood retention. In combination with the Proposed Action, continued implementation of management activities under the LRMP would cumulatively benefit wildlife habitats on MNF lands.

Geology and Soils

The Proposed Action, with the dewatering of Lake Pillsbury, has the potential to adversely affect groundwater (Section 3.4.1.7). The connectivity between groundwater and Lake Pillsbury is currently unknown. Given the absence of information, it is assumed that groundwater in the vicinity of Lake Pillsbury is charged and supported by water contained in Lake Pillsbury. Assuming this connectivity, groundwater levels may decline after the removal of Scott Dam, which could adversely affect wells and private property owners who rely on wells for their water supply. There is also the potential for slope instability during the dewatering of Lake Pillsbury. Large-scale slope failures would not be expected, but small-scale slope failures could occur, leading to increased sedimentation in the Eel River and its tributaries upstream of Scott Dam; however, the amount of sediment contributed from slope failures would not be expected to be significant compared to the amount of sediment already in Lake Pillsbury. The potential for slope failure would be reduced as the once-saturated soils dry and new vegetative growth takes root.

The LRMP includes goals, objectives, direction, and prescriptions used to guide land management activities within the MNF with respect to desired existing and future conditions. The Scott Dam Area, including Lake Pillsbury, is within the boundaries of the MNF. Continued management of actions of the MNF as guided by applicable land management planning documents, including its LRMP (USFS-MNF 1995), including goals associated with forest management and watershed protection, is not expected to contribute to adverse cumulative effects to slope instability or groundwater levels. Therefore, the Proposed Action’s incremental contribution to cumulative effects associated with groundwater levels adversely affecting wells would be cumulatively significant.

The Proposed Action would also complement some of the continued sediment management actions of the MNF, as guided by its LRMP (USFS-MNF 1995). This would aid the MNF objective of stabilizing serpentine areas along the reservoir shoreline as well as the banks of the Eel River and the Rice Fork of the Eel River at their inlets to the reservoir, which will help reduce turbidity in the Eel River downstream. In combination with the Proposed Action, continued implementation of management activities under the LRMP would cumulatively benefit geomorphology of the Eel River on MNF lands.

Geomorphology

The Proposed Action would result in the temporary alteration of the Eel River channel and/or floodplain morphology from sediment deposition after deconstruction of the dams until subsequent high-flow events can resuspend the sediment and transport it farther downstream. The deposited sediment may have an adverse short-term effect on bridge infrastructure, as well as other infrastructure such as water intakes or diversions. In the long term, the Proposed Action would remove Scott and Cape Horn dams and restore unimpaired hydrology and sediment supply/transport in the Eel River. Diversions from the Eel River to the East Branch Russian River would cease. Summer flows would be much lower, but high-flow events would still occur seasonally as a result of storm events. The East Branch Russian River channel would adjust in geomorphic form to a condition more similar to its unimpaired, natural condition prior to receiving increased flows from Eel River diversions.

In addition to Proposed Action effects, cumulative effects to geomorphology from the other actions listed in Section 3.4.2.4 are discussed by action below.

NERF Diversions

- In the Eel River downstream of NERF, the months with the highest average flows and the potential to do the most geomorphic work are December through March, with Proposed Action average monthly flows of approximately 1,100 cfs to 1,900 cfs. The magnitude of the NERF diversions would be relatively small compared to the total Eel River flow during the peak flow months. The NERF diversions would reduce the average monthly flows during these months by 3 percent to 7 percent. The maximum NERF diversion is 300 cfs, which is relatively low compared to the peak annual 2-year recurrence interval event on the Eel River for the unimpaired Proposed Action of 12,221 cfs and the 1-year event of 612 cfs (Table 3.3.1-10). Typically, however, diversions do not occur during peak flow events due to high suspended sediment concentrations. It is not anticipated that NERF diversions would affect high-flow events in a way that would affect geomorphic processes. Implementation of the NERF and potential small reduction in flows due to NERF diversions, in combination with the Proposed Action, would be minor and not significant.

  NERF operation would result in the continued diversion of water from the Eel River into the East Branch Russian River, although with a different diverted flow annual hydrograph since the Proposed Action would eliminate the ability to store water in Lake Pillsbury and thus impact the amount of flow available for NERF diversions.

  The Proposed Action would result in the reduction in peak flow for the 2-year and higher events of about 6 percent in the East Branch Russian River near Calpella compared to the existing condition (see Table 3.3.1-17 in Section 3.3.1). This flow reduction would cause a small reduction in channel-forming processes but would be unlikely to cause pronounced channel narrowing or other geomorphic changes to occur. The Proposed Action, however, would result in a large reduction (approximately 76 percent) in the 1- to 1.5-year flood event compared to the existing condition, which may result in less frequent mobilization of sediment that could increase the duration that fines accumulate in pools before being flushed out by a flood. Similarly, new vegetation could start to become more established on bars and channel margins. These potential effects are considered to have a negligible effect, however, since large flood flows would still occur on the East Branch Russian River under the Proposed Action and changes to geomorphic processes that do occur would cause the river to adjust in geomorphic form to a condition more similar to its unimpaired, natural condition prior to receiving increased flows from Eel River diversions.

Since information on how NERF diversions would alter peak annual flows is unavailable, the analysis of potential NERF cumulative effects is focused on mean monthly flows. NERF diversions would increase average monthly flows on the East Branch Russian River near Calpella from about 373 cfs in January and February under the Proposed Action of no diversions from the Eel River (which is shown as "Unimpaired Flow" in Figure 3.4.2-A-5 in Appendix 3.4.2-A) to approximately 410 cfs with NERF diversions. Thus, NERF diversions would increase average monthly flows in the peak months by about 35 cfs, or 10 percent, compared to the Proposed Action. The NERF average monthly flows in January and February, however, would be less than existing conditions (e.g., 410 cfs versus 585 cfs).

The Proposed Action in combination with NERF diversions would have a long-term cumulative benefit to geomorphology in the East Branch Russian River and a neutral effect on geomorphology in the Eel River.

Other Actions

- The Proposed Action removal of Cape Horn Dam and Scott Dam would restore unimpaired hydrology, sediment supply, sediment transport, and geomorphic processes and create a more dynamic channel formed in a diverse gradation of coarse sediment, exposed gravel and cobble bars, deeper pools with less sand accumulation, and less-dense riparian vegetation. Implementation of the Eel River Restoration and Conservation Plan, NOAA Fisheries' Coastal Multispecies Recovery Plan, and the Potter Valley Tribe's work on the Trout Creek and Alder Creek Land Acquisition would also benefit hydrology, watershed conditions, and geomorphology. These actions, in combination with the Proposed Action, would result in beneficial, long-term cumulative effects on the geomorphology of the Eel River.
- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would involve activities to manage and improve water quality, including sediment/siltation and aluminum. Removing Scott Dam and Cape Horn Dam under the Proposed Action would result in the flush of a large volume of reservoir sediments downstream, which would have a short-term unavoidable adverse effect on suspended solids, turbidity, and sediment deposition in the Eel River. In the long term, however, the unimpaired hydrology and natural sediment transport processes would re-establish a natural channel and a new natural suspended sediment and turbidity regime. The release of the Lake Pillsbury and Van Arsdale Reservoir sediment would temporarily adversely impact the objectives of the TMDLs at reducing sediment levels. Currently, Lake Pillsbury is trapping much of the sediment produced in the upper Eel River Watershed. Although the removal of the dams would not increase the long-term volume of sediment delivered from the upper watershed, it would result in sediment that is currently being trapped in the reservoirs to be transported

down the Eel River. The new natural suspended sediment and turbidity regime may increase baseline sediment loads used in the TMDLs developed for the middle and lower main Eel River. In the long term, the Proposed Action, in combination with the implementation of the TMDLs, is expected to have neutral to beneficial effects on sediment concentration in the Eel River.

- The Proposed Action would also complement some of the continued sediment management actions of the MNF, as guided by its LRMP (USFS-MNF 1995). Removal of Scott Dam will eliminate fluctuating reservoir water levels in Lake Pillsbury that can contribute to erosion along the shoreline and channel areas. This would aid the MNF objective of stabilizing serpentine areas along the reservoir shoreline as well as the banks of the Eel River and the Rice Fork of the Eel River at their inlets to the reservoir, which will help reduce turbidity in the Eel River downstream. In combination with the Proposed Action, continued implementation of management activities under the LRMP would cumulatively benefit the geomorphology of the Eel River on MNF lands.
- Climate change is predicted to lead to more frequent and intense storms that could increase the magnitude, but also decrease the duration, of peak flows for the flood events that create geomorphic change. Removal of Scott Dam and loss of runoff storage at Lake Pillsbury will restore unimpaired hydrology. For example, it is predicted that the 2-year recurrence interval event would increase by 38 percent from 7,420 cfs to 10,242 cfs at Scott Dam (see Section 3.3.1, Water Use and Hydrology). The differences would be lower for less frequently occurring flood events, and the differences would also be less with increasing distance downstream in the Eel River Watershed as other tributaries contribute flow. The unimpaired hydrology, combined with climate change, could lead to increased frequency that sediment is mobilized, channel bars and banks deposit or erode, and riparian vegetation is reset. These are natural processes. The cumulative effect of climate change and the Proposed Action is expected to be neutral to natural geomorphic processes.

Land Use

Construction and dam removal activities associated with the Proposed Action may result in short-term adverse effects on land use in the Eel River (as described in Section 3.4.1.9), including to infrastructure such as bridges located downstream of Scott Dam and Cape Horn Dam from sediment deposition and to other infrastructure along the river such as water intakes or diversions, which may be buried or plugged from sediment deposition and become inoperable or require ongoing management. The Proposed Action is expected to have a long-term adverse effect on land use from the loss of Lake Pillsbury as a source for fire suppression, which may include possible lengthened response times for acquiring water from the river or from other sources of water that are farther from a fire than Lake Pillsbury.

In addition to impacts from the Proposed Action, the potential for cumulative impacts to land use from other projects/actions listed in Section 3.4.2.4 are discussed by action below.

- The Potter Valley Tribe received a donation of 879 acres of forested lands in the mainstem Eel River Watershed in January 2019. The Tribe negotiated a land conservation proposal with the Pacific Forest and Watershed Lands Stewardship Council, which was formed as part of a PG&E settlement agreement under the bankruptcy reorganization in 2003. Among the long-range future plans are "development of recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, wildfire and fuels management, and becoming good neighbors with the stakeholders in the area" (Potter Valley Tribe 2025). Depending on actions taken by the Potter Valley Tribe, there may be additional cumulative impacts to land use, such as beneficial long-term impacts to wildfire and fuels management.
- Management actions of the MNF as guided by applicable land management planning documents, including its LRMP (USFS-MNF 1995), including goals associated with forest management and watershed protection, are not expected to contribute to adverse cumulative effects.

The above-identified projects are not expected to adversely contribute to adverse cumulative effects on land use in the Eel River and East Branch Russian River, and therefore, cumulative effects from future plans or reasonably anticipated actions along with the Proposed Action are not significantly different than the effects of the Proposed Action alone on land use.

Recreation Resources

Construction and dam removal activities associated with the Proposed Action may result in short-term adverse effects on recreational resources in the Eel River (as described in Section 3.4.1.10), including the loss of recreation opportunities at Lake Pillsbury from the drawdown of Lake Pillsbury and restricted recreation use during construction, as well as potential short-term, temporary effects to fishing opportunities and whitewater boating in the Eel River from high suspended sediment load and aquatic biota mortality. The Proposed Action is expected to have the following long-term effects on recreational resources in the Eel River and the East Branch Russian River (as described in Section 3.4.1.10):

- Loss of recreation opportunities at Lake Pillsbury with the removal of PG&E recreation facilities and ancillary features (permanent loss);
- Loss of reservoir-based recreation at Lake Pillsbury with the transition of a lacustrine to riverine environment;
- Potential reduction in fishing, whitewater, and swimming opportunities in the East Branch Russian River during low summer flows;

- Improved access for anadromous fish to tributaries upstream of the Scott Dam, providing increased opportunity for riverine fishing upstream of the Scott Dam; and
- Beneficial cumulative effects to fish and aquatic resources in the Eel River and East Branch Russian River, benefiting recreational fishing.

In addition to impacts from the Proposed Action, cumulative impacts from the actions listed in Section 3.4.2.4 are discussed by action below.

- Once completed, operation of the NERF will result in the continued diversion of water from the Eel River into the East Branch Russian River. Diverted water would be used by ERPA to maintain the health of the mainstem Russian River, continue to provide a supply of water for users, and support East Branch Russian River fisheries. In combination with the Proposed Action, implementation of these NERF diversions would provide cumulative benefits to fish and aquatic resources and recreational fishing in the East Branch Russian River.
- In combination with the Proposed Action, implementation of the following actions would provide cumulative benefits to fish and aquatic resources and recreational fishing in the Eel River:
  - Implementation of fisheries restoration plans and projects identified in the Eel River Restoration and Conservation Plan;
  - Development and implementation of TMDLs in the watershed; and
  - Implementation of recovery actions for federally protected California Coastal Chinook salmon and the Northern California steelhead DPS pursuant to the Coastal Multispecies Recovery Plan.
  - Cumulative benefits to recreational resources along the Eel River would also occur from the Trout Creek and Alder Creek Land Acquisition, Potter Valley Tribe. Among the long-range future plans are “development of recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, wildfire and fuels management, and becoming good neighbors with the stakeholders in the area” (Potter Valley Tribe 2025).
  - The MNF is expected to protect and maintain conditions on the lands managed by the MNF. Cumulative benefits to recreational resources may occur to the Lake Pillsbury basin from the following aspects of continued management of actions of the MNF:
    - Emphasis on providing quality water-oriented recreation opportunities in a manner consistent with the protection of bald eagles;
    - Coordination of the development, management, and use of the Lake Pillsbury basin;
    - Conflict resolution between OHV users and other recreationists through trail designation, administrative controls, and revision of the forest OHV plan; and
    - Opportunity analysis for the development of watchable wildlife areas and wildlife habitat interpretation for the public.

- No cumulative actions or projects have been identified that would further reduce potential impacts to recreation resources. The Proposed Action, along with other planned actions that are expected to occur in the future, would result in some beneficial long-term and cumulative effects on riverine recreational resources in the Eel River and East Branch Russian River, including benefits to fish and aquatic resources in the Eel River with the return to unimpaired hydrology and geomorphic processes, benefiting recreational fishing. The Proposed Action's incremental contribution to cumulative effects on recreation resources along the Lake Pillsbury basin of the Eel River due to the loss of recreation opportunities at Lake Pillsbury with the removal of PG&E recreation facilities and ancillary features would be significant.
- The Proposed Action, along with other planned actions that are expected to occur in the future, would result in some beneficial long-term and cumulative effects on riverine recreational resources in the Eel River and East Branch Russian River and will also result in some adverse long-term effects on lacustrine recreational resources (as described below and in Sections 3.4.1.10 and 3.5.1.10) along the Lake Pillsbury basin of the Eel River.

Cultural Resources

Other actions in combination with the Proposed Action would result in an overall adverse cumulative effect to cultural resources. Because significant cultural resources are unique and non-renewable members of finite classes, all adverse effects erode a dwindling resource base. The loss of any one cultural resource could affect the scientific value of others in a region because these resources are best understood in the context of the entirety of the cultural system of which they are a part.

Archaeological Sites

Implementation of other actions and the Proposed Action would result in cumulative adverse effects on archaeological sites. Due to restoration of natural flows, seasonal flows will be higher and the increased flow could result in new bank erosion and expose and erode archaeological sites. In addition, physical damage to known and unknown archaeological sites could occur through construction-related ground disturbance and draining of reservoirs, which would expose and allow increased access to previously inundated archaeological sites, resulting in looting and vandalism.

Built Environment

Implementation of other actions and the Proposed Action would result in cumulative adverse effects on built-environment resources. No resource-specific studies have been conducted to help identify the specific effects to built-environment cultural resources. However, given the absence of information, it is assumed the deconstruction and removal of the hydroelectric facilities would have adverse effects on a hydroelectric facility that may be eligible for listing in the National Register of Historic Places. In addition, other actions could result in changes to the character, use, or physical setting of built-environment resources that contribute to the resource's historic significance.

Tribal Resources

The Proposed Action, along with other planned actions that are expected to occur in the future, would result in an overall cumulative benefit to Tribal resources, especially restoration of native fisheries (see Fish and Aquatic Resources section above), other ethnobiological resources (see Botanical and Wildlife Resources sections above), and water quality. Implementation of restoration plans, the fisheries restoration plans, projects identified in the Eel River Restoration and Conservation Plan, and implementation of recovery actions under NOAA Fisheries' Coastal Multispecies Recovery Plan if developed in consultation with Tribes would result in benefits to water quality, aquatic resources, fisheries, and terrestrial resources used by all Tribes. These benefits would aid in the continuation and restoration of Tribal practices and traditions that have been adversely affected by the creation of the hydroelectric project and dams on the Eel River.

Ground disturbance from the Proposed Action coupled with other actions that are expected to occur in the future, plus indirect effects from erosion and sedimentation, may cause cumulative adverse effects to part of known and unknown archaeological sites and other non-renewable Tribal resources including human remains. The cumulative loss of non-renewable Tribal resources could diminish the religious and cultural significance of the resource by changing the contributing elements, character, use, or physical and sensory setting of Traditional Cultural Places (TCPs), Traditional Cultural Landscapes (TCLs) and other significant Tribal resources.

Socioeconomics

Construction of the NERF and continuation of interbasin transfers into the East Branch Russian River are expected to offset the adverse socioeconomic effects of the Proposed Action on the Russian River Watershed (under the Proposed Action the diversions to the East Branch Russian River would cease), including effects related to water reliability and cost, energy reliability and cost, economic opportunity, habitat and species values, recreation value, local government fiscal conditions, and community way of life. As such, there are no cumulative adverse effects expected in the Russian River Watershed.

There are negligible effects expected in the Cape Horn Dam Area from the Proposed Action except for potential adverse effects on recreation and habitat- and species-related values. To the extent that climate change exacerbates droughts and reduces water levels and adversely affects aquatic habitat quality and recreation opportunities, the cumulative effects will be adverse on recreation value and species- and habitat-related values.

Climate change effects of increased occurrence and severity of wildfires and upward trending annual acreage burned in wildfires in California (CARB 2023) may compound potential adverse socioeconomic effects in the Scott Dam Area. The potential adverse effects of the Proposed Action's change from a lacustrine to riverine environment at Lake Pillsbury and the return to unimpaired Eel River flows on population, housing, recreation value, and economic opportunity could be exacerbated by increased wildfire risk due to climate change. Recreation value can decline due to wildfires due to closure of recreation areas during and following wildfire events and due to changes in the quality of the recreation resulting from changes in vegetation and aesthetics. Property values, property damage, and population decline can also be adversely affected by increased wildfire risk. As such, the cumulative effects from the Proposed Action and climate change on recreation, property values, population, and associated economic opportunity may be adverse in the Scott Dam Area. The removal of the dams and associated habitat restoration in the Eel River under the Proposed Action will increase watershed resiliency and help to counteract the potential adverse effects of climate change on recreation, habitats, and species in the Eel River Watershed, and the economic opportunity, recreation value, and habitat and species-related values in the watershed. There are no adverse effects projected in the Eel River Watershed from the Proposed Action, so there are no cumulative adverse effects anticipated.

Noise

Phase 1 of the Proposed Action would result in temporary and brief unavoidable adverse noise effects at noise-sensitive areas associated with the use of off-road construction equipment and helicopters. PG&E would implement noise reduction measures, including limiting the time period for noise-generating activities. Implementation of the Construction Noise Measures would reduce the Project-specific impacts related to noise.

In order for noise impacts to combine, the noise-generating activities must occur at the same time and within the same area. Noise-level increases generated during Phase 1 of the Proposed Action would be site-specific to each disturbance area. Implementation of past, present, and reasonably foreseeable actions that may occur in the Project vicinity, listed in Section 3.4.2.4, are not expected to cumulatively combine with the noise impacts associated with the Proposed Action. For example, implementation of the Eel River Restoration and Conservation Plan would not include noise-generating activities that would occur within the immediate vicinity and at the same time as PG&E's construction activities. Similarly, development and implementation of the TMDLs in the watershed would not result in noise-generating activities in proximity to the Proposed Action disturbance areas. Continued management actions included as part of the MNF LRMP may occur near the Scott Dam disturbance area; however, given the rural setting and distance to the nearest receptors, adverse cumulative noise impacts are not expected to occur.

Therefore, the Proposed Action's incremental contribution to cumulative effects related to noise would not be significant.

Marine Resources

The Proposed Action would result in temporary elevated suspended sediment concentrations that will extend along the entire length of the Eel River and Eel River estuary and into the ocean, as well as elevated toxins, nutrients, suspended solids, and pathogens that may result in an avoidable adverse impact to marine resources. The initial release of sediment and reduction of dissolved oxygen concentrations downstream of Scott Dam would result in unavoidable, short-term adverse effects to salmonids and other fish and aquatic organisms, which could include mortality and impaired function. In the long term, hydrology, suspended sediment, and geomorphic processes would return to unimpaired conditions, with high-flow events transporting watershed-derived suspended sediment out to the ocean (Section 3.4.1.19).

Projects under consideration to be implemented that could make a beneficial contribution to the overall cumulative effects to marine resources include the following:

- Operation of the NERF to continue diverting water to the East Branch Russian River for use by ERPA;
- Eel River Restoration and Conservation Plan;
- Development and implementation of TMDLs in the watershed (USEPA 2004, 2005, 2007);
- Implementation of recovery actions for federally protected California Coastal Chinook salmon and the Northern California steelhead DPS pursuant to the Coastal Multispecies Recovery Plan (NOAA 2016); and
- Continued management of actions of the MNF as guided by applicable land management planning documents, including its LRMP (USFS-MNF 1995).

In addition to impacts from the Proposed Action, cumulative impacts from these projects/actions are discussed by action below.

NERF Diversions

- As described in the Water Use and Hydrology section above, operation of the NERF would result in flow diversions to the East Branch Russian River between November and June, with minimal diversions in August–October. In combination with the Proposed Action and removal of the dams, operation of the NERF would result in a more natural hydrograph pattern in the Eel River and less flow diversions out of the Eel River during the summer to early fall, which would be an overall benefit to marine resources.

Other Actions

- The projects listed above including the Eel River Restoration and Conservation Plan and the Coastal Multispecies Recovery Plan would support restoration efforts for habitat and multiple listed salmonid species recovery plans. These projects include aquatic habitat connectivity, riverine habitat restoration, estuary habitat restoration, instream flow protection, improving water quality and water temperature, riparian and wetland habitat restoration, invasive species management, and sediment control. These projects align with recovery goals for California Coastal Chinook salmon and the Northern California steelhead DPS. Implementation of TMDLs in the watershed (USEPA 2004, 2005, 2007) in parallel with ongoing management of the MNF, and including its LRMP (USFS-MNF 1995), would support an improvement in the management of Eel River resources and, as a result, the marine resources. The implementation of these projects would also support the prolonged stewardship of the Eel River.
- The Proposed Action's incremental contribution to the adverse effects to marine resources from the short-term, temporary unavoidable adverse effects to water quality from removal of the dams that may affect marine resources would likely not be reduced by these other projects. Therefore, the Proposed Action's incremental contribution to cumulative effects on marine resources would be significant in the short term but beneficial in the long term with the return

to unimpaired hydrology and geomorphic processes. Ultimately, the unimpaired hydrology of the Eel River and restoration of habitat for the two listed species, Chinook salmon and Northern California steelhead DPS, would be an overall improvement of their habitat and respective essential fish habitats and supportive of their respective ESA recovery plans.

3.4.2.6 Cumulative Effects on Climate Change

Global climate change refers to the increase in the average temperature of the Earth's atmosphere and oceans and its projected continuation. The causes of global change have been linked to both natural processes and human actions. According to the Intergovernmental Panel on Climate Change, increasing greenhouse gas (GHG) concentrations resulting from human activity, such as fossil fuel combustion and deforestation without adequate revegetation, has been largely responsible for human-induced global warming (IPCC 2023). Increases in the concentrations of GHGs in the atmosphere decrease the amount of solar radiation reflected back into space, intensifying the natural "greenhouse effect" and resulting in the increase of global average temperatures. The most common GHGs include carbon dioxide and water vapor, although there are several others, such as methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The potential heat trapping ability of each of the GHGs varies substantially. To account for these differences in warming effect, GHGs are defined by their global warming potential (GWP). In this analysis, GHGs are reported as carbon dioxide equivalents (CO_2e) to measure their relative potency.

GHG impacts are inherently cumulative, and all GHG emissions contribute to the significant environmental impacts of global climate change. Although an individual project cannot generate enough GHG emissions to change climatic conditions, the combination of GHG emissions from an individual project in combination with other future projects could contribute to global climate change. This analysis focuses on the potential incremental contribution of the Proposed Action in combination with past and current projects and reasonably foreseeable future projects on GHG emissions within California.

The geographic scope of this cumulative GHG analysis is the State of California because the state is the controlling legal authority on GHG emissions in the Project Area. The most recent statewide climate change legislation is Assembly Bill 1279, The California Climate Crisis Act, which establishes the policy of the state to achieve carbon neutrality as soon as possible, but no later than 2045, and maintain net negative GHG emissions thereafter. The following discussion considers how the Proposed Action, in combination with other cumulative projects within the state, may affect achievement of the goals established in Assembly Bill 1279.

The Potter Valley Powerhouse has not generated power since May 2021. Under the No-Action Alternative, the existing conditions would persist and power generation would not occur at the Potter Valley Powerhouse. A transformer has been out of service and has not been replaced due to the license surrender. Under the Proposed Action, decommissioning of the Project would eliminate PG&E's generation capabilities at the powerhouse.

As presented in Section 3.4.1.16, Air Quality, using conservative estimates, implementation of the Proposed Action would emit a total of approximately 10,564.52 metric tons of CO_2e. These construction emissions would be temporary and intermittent and would cease upon completion of work. Additionally, compared to total annual GHG emissions within the State of California (381.3 million metric tons of CO_2e [CARB 2023]), GHG emissions from the Proposed Action would constitute a maximum of 0.0028 percent of total inventoried emissions. Therefore, although GHG emissions and global climate change are inherently cumulative impacts, the incremental contribution of Project construction emissions in the context of statewide emissions is negligible.

In conclusion, impacts of the Proposed Action on GHG emissions and the resulting effect on global warming, when considering other projects and actions across the state, are negligible.

3.4.2.7 References

Cal Trout *et al.* (California Trout, Stillwater Sciences, Applied River Sciences, and UC Berkeley). 2024. Eel River restoration and conservation plan—phase 1: planning—of the Eel River Watershed Restoration and Conservation Program. Prepared for California Department of Fish and Wildlife. June 2024.

CARB (California Air Resources Board). 2023. California greenhouse gas emissions from 2000 to 2021: Trends of emissions and other indicators. Available online at: https://ww2.arb.ca.gov/sites/default/files/2023-12/2000_2021_ghg_inventory_trends.pdf. Accessed October 2024.

IPCC (Intergovernmental Panel on Climate Change). 2023. Climate change 2023 synthesis report: Summary for policymakers. Available online: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf. Accessed January 2025.

NOAA (NOAA Fisheries). 2016. Coastal multispecies recovery plan. Available online: https://www.fisheries.noaa.gov/resource/document/final-coastal-multispecies-recovery-plan-california-coastal-chinook-salmon. Accessed January 2025.

Potter Valley Tribe. 2025. Our project: Eel River – Trout Creek and Alder Creek Land Acquisition. Available online: https://pottervalleytribe.com/projects/. Accessed January 2025.

USEPA (U.S. Environmental Protection Agency). 2004. Upper main Eel River and tributaries (including Tomki Creek, Outlet Creek, and Lake Pillsbury) Total Maximum Daily Loads for sediment and temperature. USEPA, Region IX, San Francisco, California.

USEPA (U.S. Environmental Protection Agency). 2005. Final middle main Eel River and tributaries (from Dos Rios to the South Fork) Total Maximum Daily Loads for temperature and sediment. USEPA Region IX, San Francisco, California.

USEPA (U.S. Environmental Protection Agency). 2007. Lower Eel River Total Maximum Daily Loads for temperature and sediment. USEPA Region IX, San Francisco, California.

USFS-MNF (U.S. Forest Service – Mendocino National Forest). 1995. Mendocino National Forest land and resource management plan (LRMP). February. Available at: https://www.fs.usda.gov/detailfull/mendocino/landmanagement?cid=FSBDEV3_004518.

Appendix 3.4.2-A

Long-term Operations of the New Eel-Russian Facility

This Page Intentionally Left Blank

A.1 Long-term Operations of the New EEL-RUSSIAN FACILITY

Pacific Gas and Electric Company was provided modeling output of potential New Eel-Russian Facility (NERF) pump station long-term operations and resulting hydrology for a period of record from water years 1911 through 2017. The provided modeling outputs include a Lower Limit Scenario and an Upper Limit Scenario for three locations: (1) diversions to the Potter Valley Irrigation District (PVID), (2) diversions to the East Branch Russian River, and (3) release to the Eel River below the NERF. Appendix 3.4.2-A, Table 3.4.2-A-1, summarizes the diversions to each of these locations under the two scenarios for the period of record. The deliveries and diversions under the Lower Limit Scenario and Upper Limit Scenario are compared in the following figures:

- Figure 3.4.2-A-1 compares the average monthly deliveries to PVID under the Lower Limit Scenario and Upper Limit Scenario.
- Figure 3.4.2-A-2 compares the average monthly diversions to the East Branch Russian River under the Lower Limit Scenario and Upper Limit Scenario.
- Figure 3.4.2-A-3 compares the average monthly total NERF diversions under the Lower Limit Scenario and Upper Limit Scenario.
- Figure 3.4.2-A-4 compares the average monthly flow in the Eel River below the NERF under the Lower Limit Scenario, the Upper Limit Scenario, and unimpaired flow.
- Figure 3.4.2-A-5 compares the average monthly flow in the East Branch Russian River at Calpella under the Lower Limit Scenario, the Upper Limit Scenario, and unimpaired flow.
- Figure 3.4.2-A-6 compares the average monthly Eel River flows at the NERF and total diverted flow, Upper Limit Scenario.
- Figure 3.4.2-A-7 compares the average monthly flows in the Eel River at the NERF and total diverted flow, Lower Limit Scenario.
- Figure 3.4.2-A-8 compares the annual deliveries to PVID from the NERF under the Lower Limit Scenario and Upper Limit Scenario.
- Figure 3.4.2-A-9 compares the annual diversions to the East Branch Russian River from the NERF under the Lower Limit Scenario and Upper Limit Scenario.
- Figure 3.4.2-A-10 compares the annual flows in the Eel River at the NERF and total diverted flow, Upper Limit Scenario.
- Figure 3.4.2-A-11 compares the annual flows in the Eel River at the NERF and total diverted flow, Lower Limit Scenario.
- Figure 3.4.2-A-12 compares the annual unimpaired and diverted flows in the East Branch Russian River at Calpella, Upper Limit Scenario.

Figure 3.4.2-A-13 compares the annual unimpaired and diverted flows in the East Branch Russian River at Calpella, Lower Limit Scenario. The Sonoma Water modeling prioritizes meeting potential future minimum instream flow requirements before making diversions into the diversion tunnel. When water is available for diversion, there are constraints on diversions to PVID and diversions to the East Branch Russian River, as outlined below.

A.1.1 Lower Limit Scenario

Diversions to PVID. The Lower Limit Scenario has diversions to PVID of up to 100 cubic feet per second (cfs), with an annual limit on diversions of 3,000 acre-feet (ac-ft) per year. Diversions occur throughout the year when flow is available and are not limited to the diversion season. The annual limit is reached in all but the two driest years in the 107-year period of record.

Diversions to the East Branch Russian River. The total diversion capacity into the diversion tunnel would be 300 cfs. The Lower Limit Scenario has diversions to the East Branch Russian River of up to 300 cfs, which are often limited to 200 cfs when there are diversions to PVID. Annual diversions to the East Branch Russian River in the Lower Limit Scenario range from 1,850 ac-ft to 50,200 ac-ft depending on hydrologic availability.

Release to the Eel River below the NERF. Daily releases to the Eel River below the NERF range from 70 percent to 100 percent of unimpaired flow. This is consistent with the concept for the previous Reasonable and Prudent Alternative (RPA) minimum instream flow requirement for the Eel River below Cape Horn Dam, which generally required a release to the Eel River of 70 percent of unimpaired flow. Annual release volumes range from 82 percent to 99 percent of unimpaired flow.

A.1.2 Upper Limit Scenario

Diversions to PVID. The Upper Limit Scenario has diversions to PVID of up to 150 cfs, with an annual limit on diversions of 8,000 ac-ft per year. Diversions occur throughout the year when flow is available and are not limited to the diversion season. The annual limit is reached in 90 percent of the years in the 107-year period of record, as shown on Figure 3.4.2-A-7.

Diversions to the East Branch Russian River. The total diversion capacity into the diversion tunnel would be 300 cfs. The Upper Limit Scenario has diversions to the East Branch Russian River of up to 300 cfs, which are often limited to 210 cfs when there are diversions to PVID. Annual diversions to the East Branch Russian River in the Lower Limit Scenario range from 1,850 ac-ft to 45,300 acre-feet depending on hydrologic availability.

Release to the Eel River below the NERF. Daily releases to the Eel River below the NERF would range from 70 percent to 100 percent of unimpaired flow. This is consistent with the concept for the previous RPA minimum instream flow requirement for the Eel River below Cape Horn Dam, which generally required a release to the Eel River of 70 percent of unimpaired flow. Annual release volumes range from 82 percent to 99 percent of unimpaired flow.

Table 3.4.2-A-1. Annual average flow volumes, acre-feet.

	Lower Limit Scenario	Upper Limit Scenario	Unimpaired Flow
Diversions to PVID	7,746	2,966	0
Diversions to East Branch Russian River	24,753	27,516	0
Total NERF Diversions	32,499	30,482	0
Flow in Eel River below the NERF	461,623	463,640	494,122
Flow in East Branch Russian River at Calpella stream gage	111,000	113,763	86,247

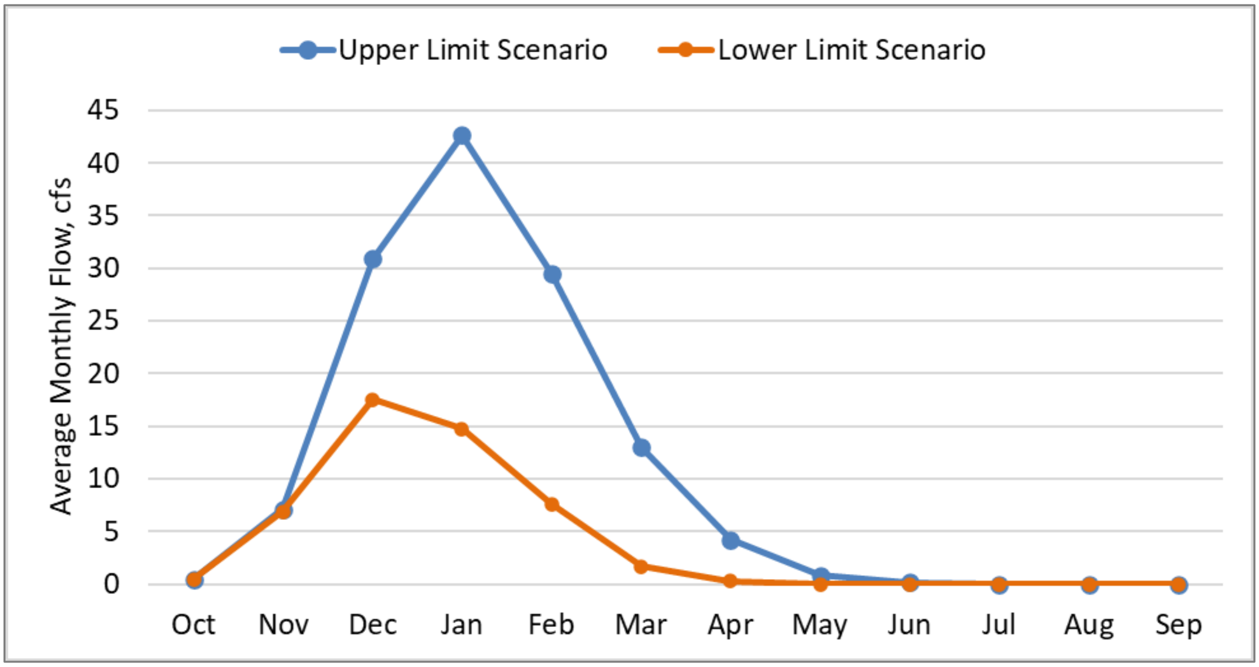


Figure 3.4.2-A-1. Average monthly deliveries to PVID from the NERF.

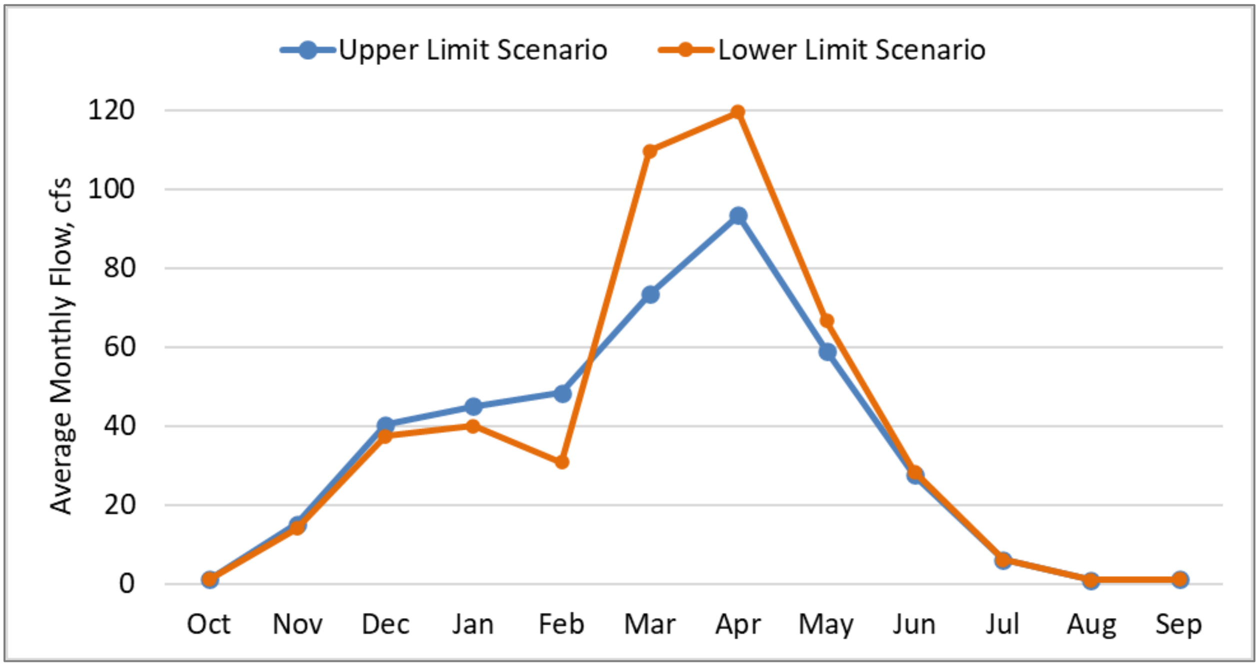


Figure3.4.2-A-2. Average monthly diversions to East Branch Russian River from the NERF.

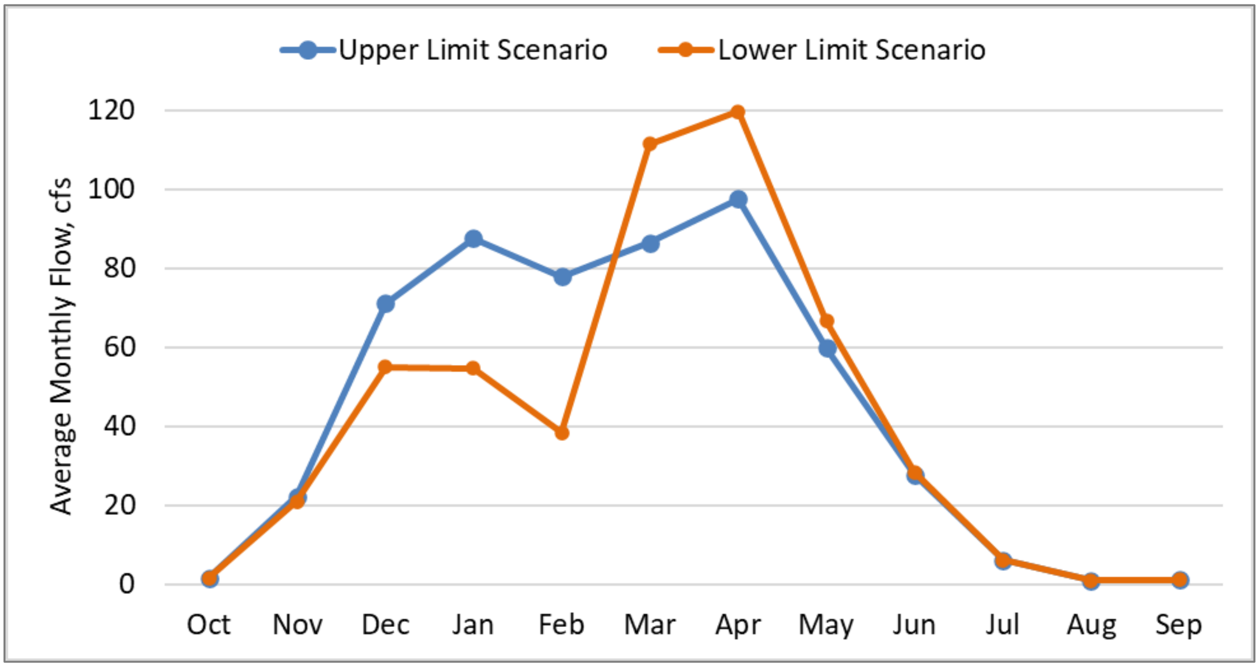


Figure 3.4.2-A-3. Average monthly total NERF diversions.

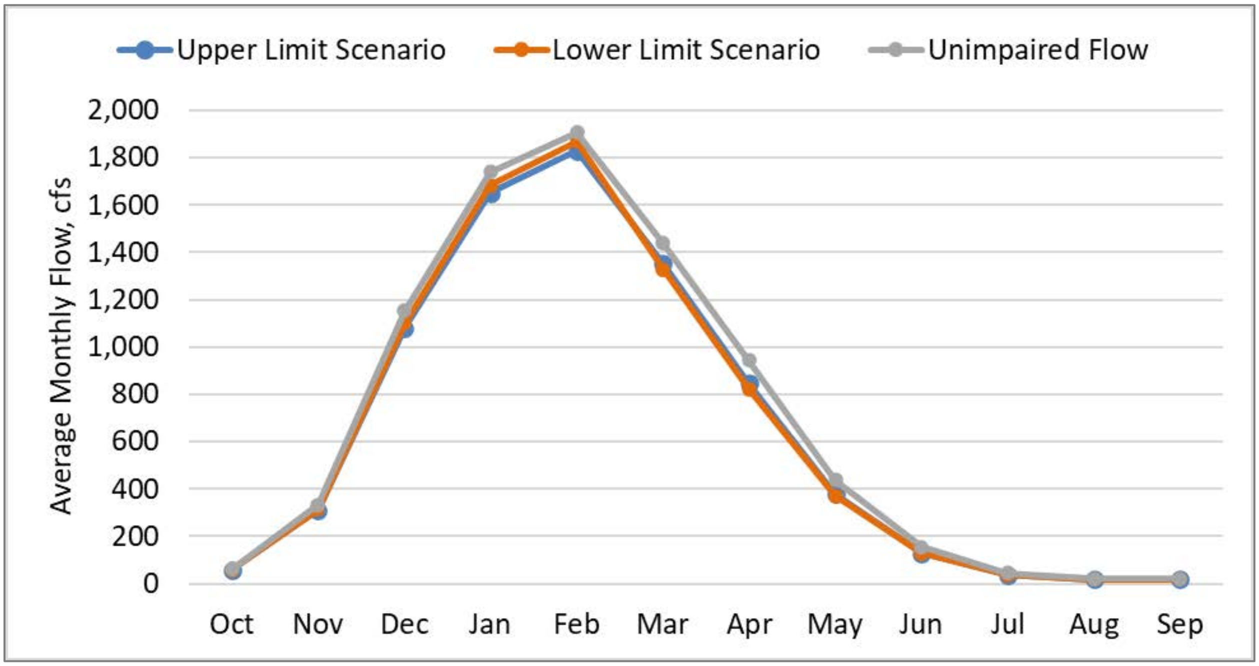


Figure 3.4.2-A-4. Average monthly flow in Eel River below the NERF.

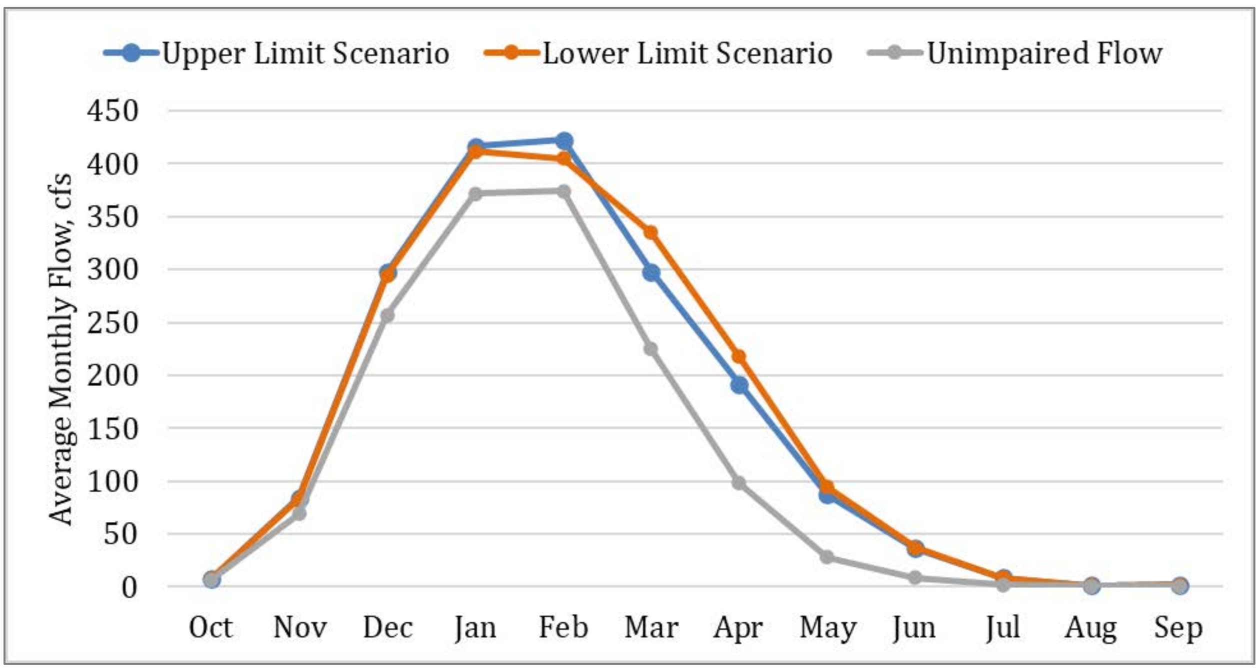


Figure 3.4.2-A-5. Average monthly flow in East Branch Russian River at Calpella.

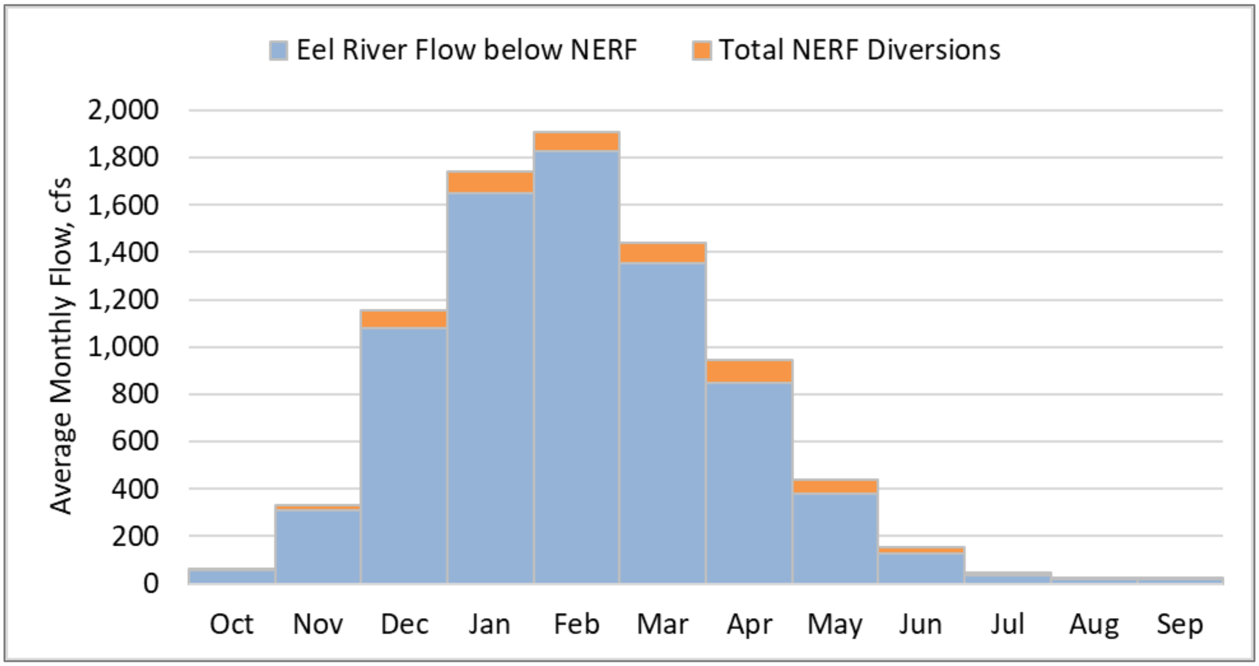


Figure 3.4.2-A-6. Average monthly flows in the Eel River at the NERF, Upper Limit Scenario.

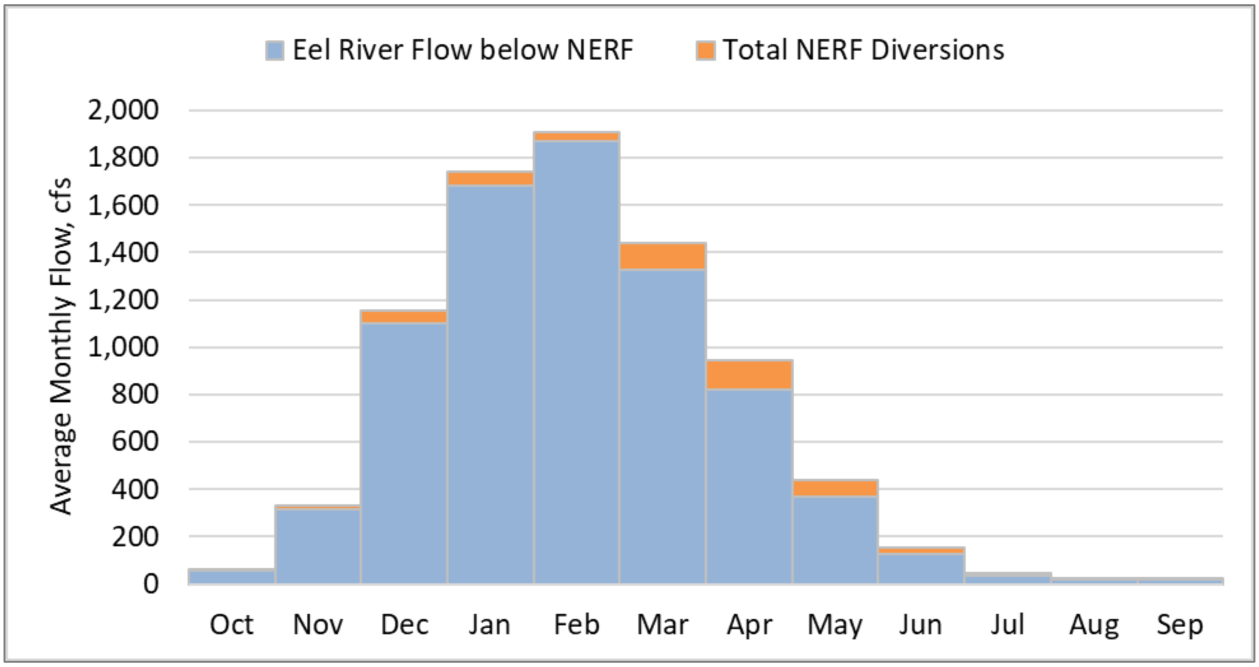


Figure 3.4.2-A-7. Average monthly flows in the Eel River at the NERF, Lower Limit Scenario.

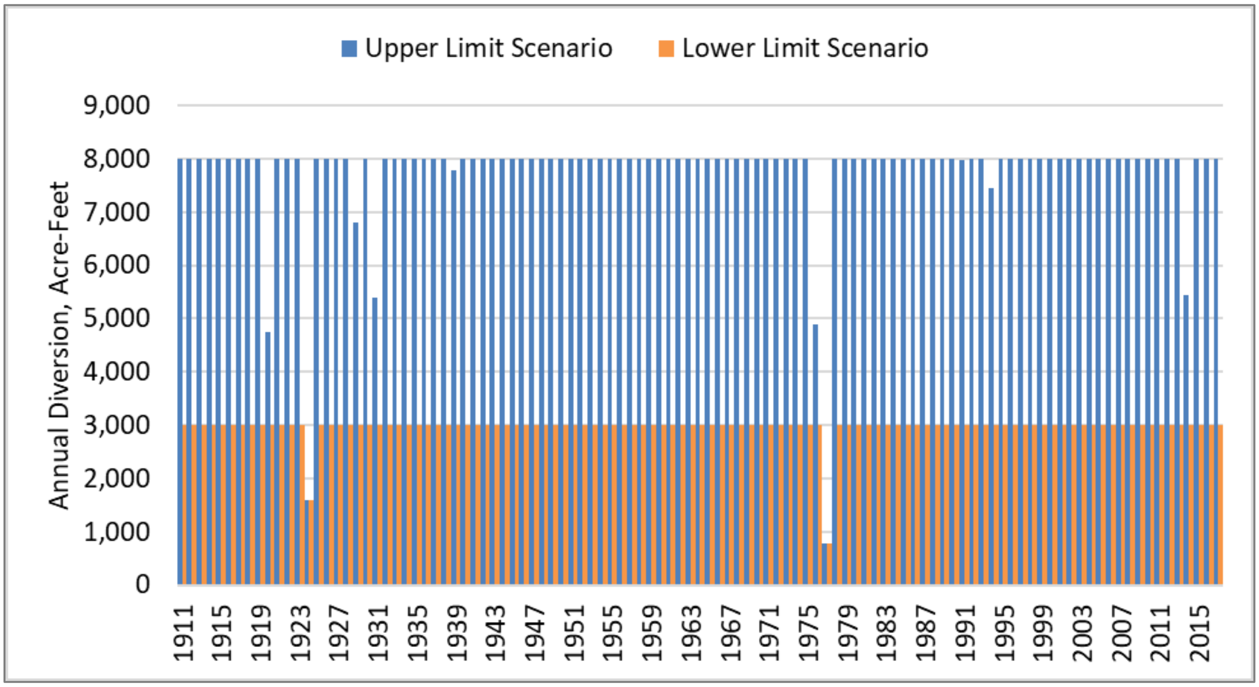


Figure 3.4.2-A-8. Annual deliveries to PVID from the NERF.

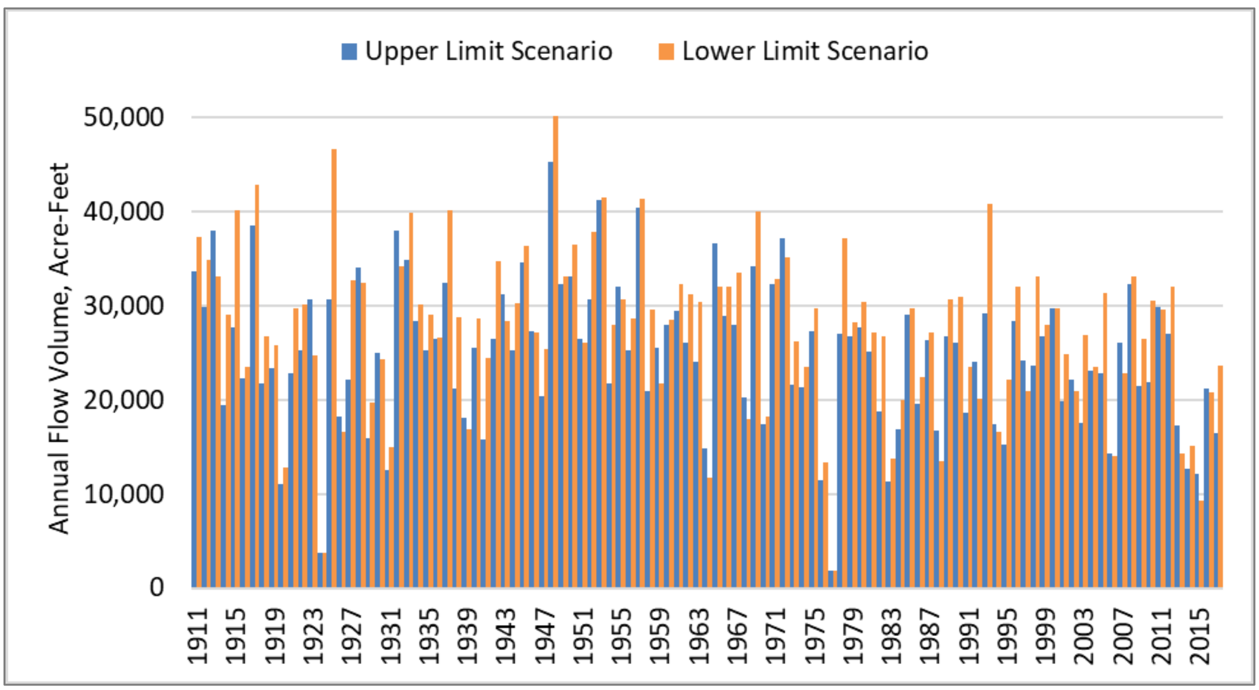


Figure 3.4.2-A-9. Annual diversions to East Branch Russian River from the NERF.

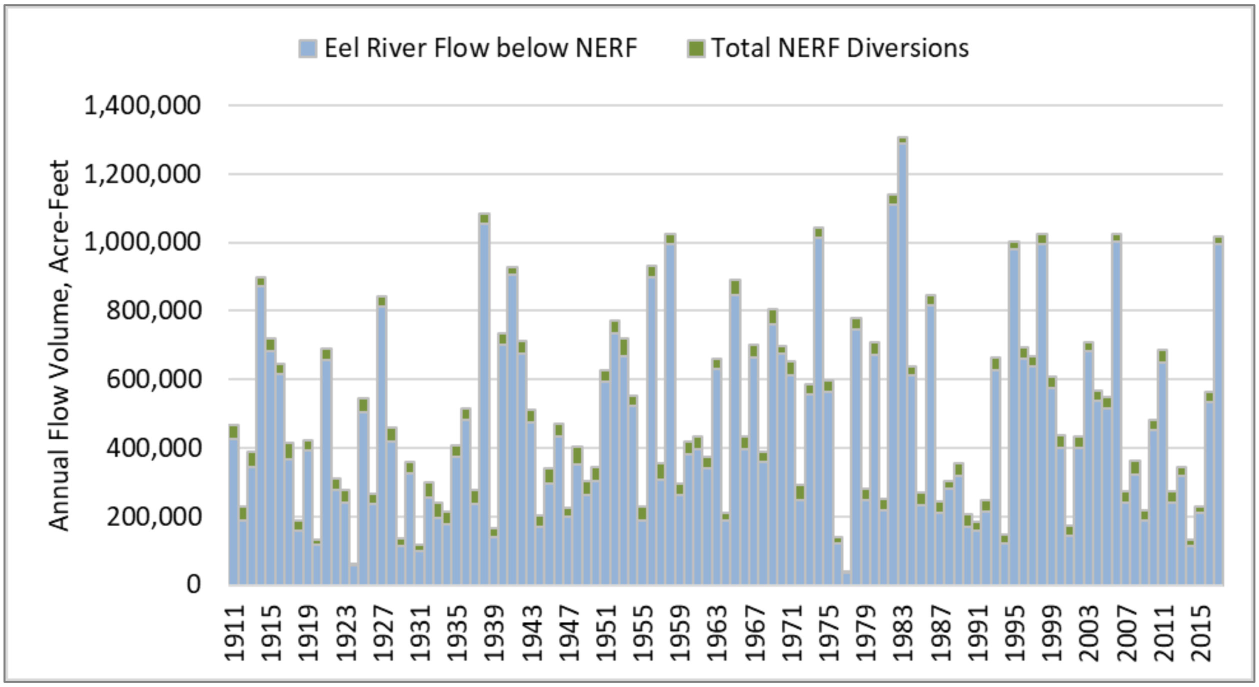


Figure 3.4.2-A-10. Annual flows at the NERF, Upper Limit Scenario.

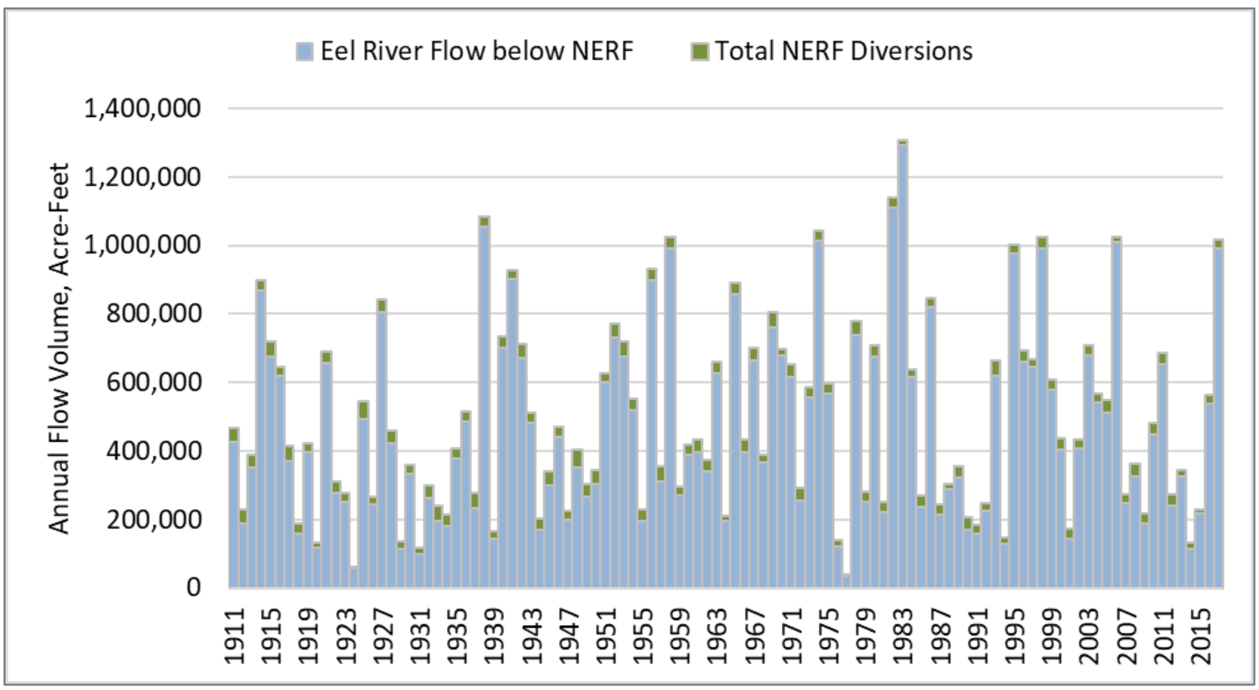


Figure 3.4.2-A-11. Annual flows at the NERF, Lower Limit Scenario.

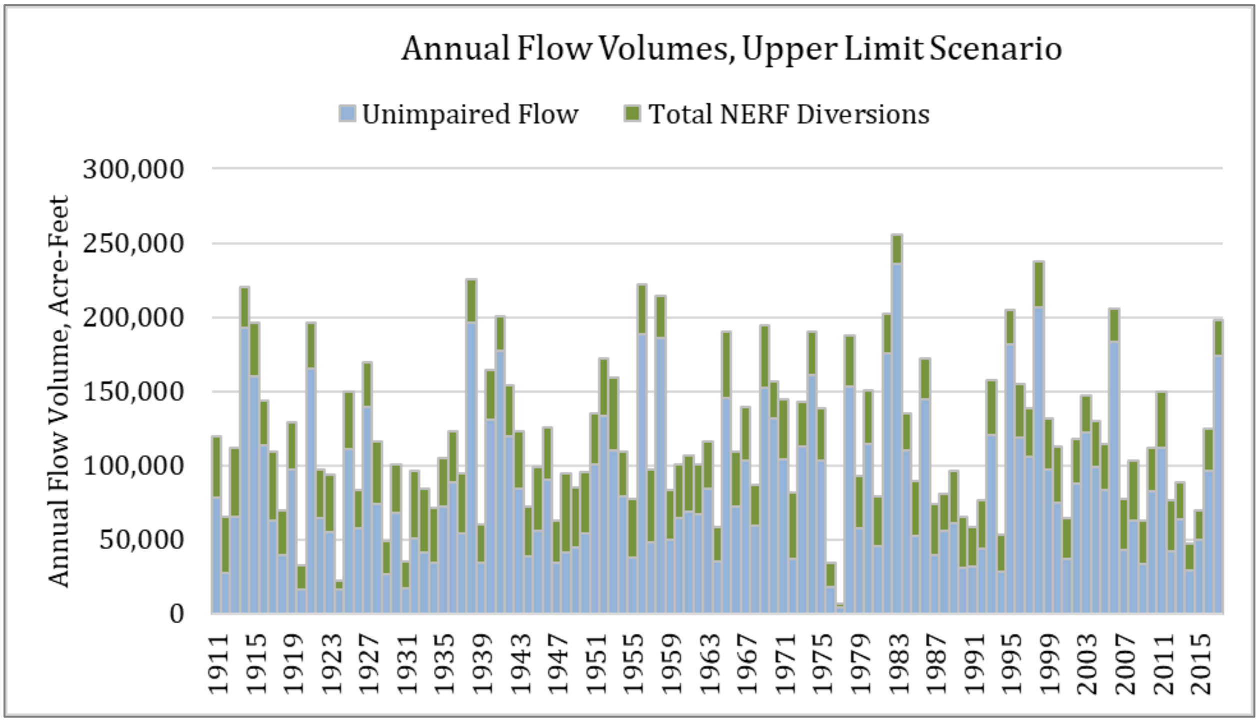


Figure 3.4.2-A-12. Annual flow in East Branch Russian River at Calpella, Upper Limit Scenario.

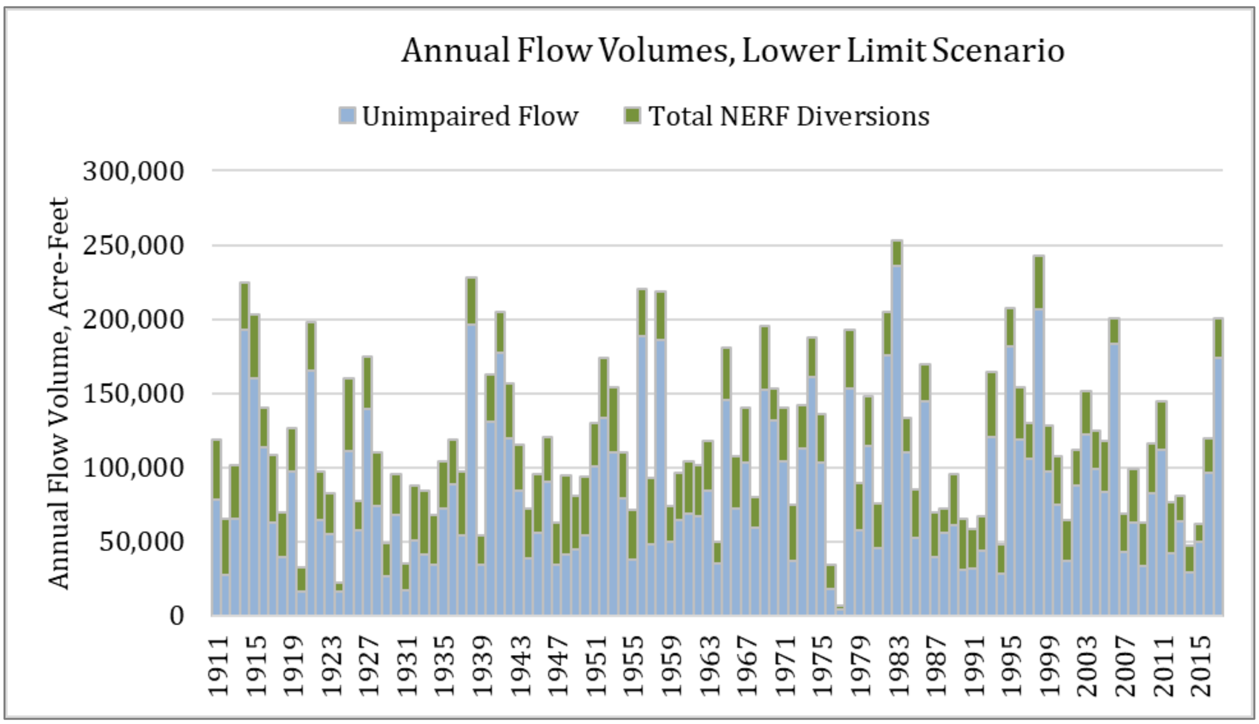


Figure 3.4.2-A-13. Annual flow in East Branch Russian River at Calpella, Lower Limit Scenario.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Tables

List of Acronyms

BMP	best management practice
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Public Lands
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

This Page Intentionally Left Blank

3.5 Application for Non-Project Use of Project Lands

Pacific Gas and Electric Company (PG&E) is requesting the Federal Energy Regulatory Commission (FERC) authorize, under License Article 5 of Form L-5 included in the FERC License Order Issued December 4, 1983 (FERC 1983) as Amended January 28, 2004 (FERC 2004), a non-project of use of project lands to allow the Eel-Russian Project Authority (ERPA) to modify existing Project works and construct the New Eel-Russian Facility (NERF). The NERF, once constructed, will divert water from the Eel River to the existing Van Arsdale tunnel inlet and allow for future diversion to the East Branch Russian River. This submittal only requests authorization from FERC for the construction of certain components of the NERF, which include the construction of a new pump station, a conduit from the pump station to the tunnel inlet, and retaining wall; placement of fill behind the concrete retaining wall; and modifications to the Potter Valley Powerhouse.

In its Application for Surrender of License, PG&E is requesting the transfer of all necessary facilities and lands for the NERF to ERPA immediately after: (1) PG&E has completed decommissioning work at Cape Horn Dam and other Project works associated with the NERF, (2) the NERF has been constructed, and (3) PG&E has filed a completion report to FERC on these actions. Under a separate environmental review process, ERPA would obtain all necessary permits and approvals for additional construction activities and to allow for operation of the NERF and continued diversion to the East Branch Russian River (see Volume I, Section 3 for a description of ERPA's permitting approach).

3.5.1 Environmental Effects

This section analyzes the potential effects of construction of the NERF pump station and conveyance of water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River. Other construction activities associated with the NERF and future operation of the facility by ERPA will require separate environmental analysis on environmental and cultural resources and permits/approvals to be completed/obtained by ERPA.[1] The Proposed Action for Non-Project Use of Public Lands (NPUPL Proposed Action) is described in Section 2.2.2 and includes the following:

- Cape Horn Dam
  - Removal/repositioning of sediment to provide construction access;
  - Construction of the new pump station and ancillary facilities;
  - Construction of the concrete retaining wall;
  - Construction of a conduit from the pump station to the tunnel inlet; and
  - Placement of fill behind the concrete retaining wall.

[1] Potential effects of the long-term operations of the NERF are evaluated in the cumulative effects sections (Sections 3.4.2 and 3.5.2).

- Potter Valley Powerhouse
  - Installation of an energy dissipation valve and associated instrumentation at the Potter Valley Powerhouse

It is planned that construction of ERPA's NERF project components (Section 2.2.2) would be completed within the same season as PG&E's removal of Cape Horn Dam and associated Project facilities and features when the Eel River in the vicinity of the dam is dewatered for PG&E's decommissioning activities. Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Application for Surrender for License Proposed Action, and potential effects of these activities to environmental and cultural resources are analyzed in Section 3.4; these effects are not analyzed in this section.

The analyses presented in this section are based on the information presented in Section 3.3, which documents the environmental, recreational, and cultural resource conditions as they exist at the time environmental reviews begin. Section 3.3 was based on information included in PG&E's Pre-Application Document for the Project (PG&E 2017), data collected as part of initiation of 21 approved study plans developed as part of the relicensing process (PG&E 2018), and information included in PG&E's Initial Draft Surrender Application and Conceptual Decommissioning Plan (PG&E 2023). Additional information available for the Project area is also incorporated, as appropriate.

Following an overview of the analytical approach (Section 3.5.1.1), potential environmental effects that could occur under the NPUPL Proposed Action relative to the No-Action Alternative are discussed in detail in Sections 3.5.1.2 through 3.5.1.16,[2] organized as follows:

- 3.5.1.2, Water Use and Hydrology;
- 3.5.1.3, Water Quality;
- 3.5.1.4, Fish and Aquatic Resources;
- 3.5.1.5, Botanical Resources;
- 3.5.1.6, Wildlife Resources;
- 3.5.1.7, Geology and Soils;
- 3.5.1.8, Geomorphology;
- 3.5.1.9, Land Use;
- 3.5.1.10, Recreation Resources;
- 3.5.1.11, Aesthetic Resources;
- 3.5.1.12, Cultural Resources;
- 3.5.1.13, Tribal Resources;

[2] Effects to traffic, air quality, and noise will be evaluated under the California Environmental Quality Act (CEQA).

- 3.5.1.14, Socioeconomic Resources;
- 3.5.1.15, Environmental Justice; and
- 3.5.1.16, Marine Resources.

3.5.1.1 Analytical Approach

This section describes the approach used to identify and analyze the potential effects of construction of certain NERF components and modification of the Potter Valley Powerhouse (see Section 2.2.2) on environmental and cultural resources relative to the existing baseline condition. As stated above, it is planned that ERPA will construct these components in the same season as PG&E's removal of Cape Horn Dam. PG&E will construct cofferdams to dewater this segment of the Eel River and will construct a flow bypass channel to reroute flows around the dewatered segment. Therefore, this segment of the Eel River would by dewatered only once for the NERF and Cape Horn Dam decommissioning construction activities. Map 2-11a shows the footprint of the NERF construction area at Cape Horn Dam, and Map 2-11b shows the footprint of NERF construction at the Potter Valley Powerhouse. The analysis area for some resources includes a buffer around the construction area(s) to account for effects that may occur beyond the construction boundary. The analysis area is specified in each resource section, as applicable.

The effects determination for each resource area considers construction best management practices (BMPs), environmental measures, and plans under the NPUPL Proposed Action compared to the No-Action Alternative. The No-Action Alternative is existing conditions, without the NERF's construction. The following effects determinations were used in the analysis:

- **No Effect –** Implementation of the NPUPL Proposed Action will protect and maintain a resource.
- **Negligible Effect –** Implementation of the NPUPL Proposed Action will have a negligible effect on a resource, or the implementation of environmental measures will reduce the effect to a negligible level.
- **Adverse Effect –** Implementation of the NPUPL Proposed Action will have a significant effect on a resource that may be reduced, but not to a negligible level, through implementation of new environmental measures.
- **Beneficial Effect (Enhancement) –** Implementation of the NPUPL Proposed Action will benefit the resource.

Table 3.5.1-1 identifies the avoidance and protection measures for resource areas potentially affected by NERF construction. A summary of environmental measures to avoid or reduce potential effects to environmental and cultural resources to be implemented by ERPA is provided in Section 2.2.3.

Table 3.5.1-1. Summary of avoidance and protection measures under the NPUPL Proposed Action by resource area.

Measure	Potentially Affected Resource														
	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomics Resources	Environmental Justice	Marine Resources
General Construction Measures				x	x						x	x			
Water Use and Hydrology Measures															
Construction East Branch Russian River Diversion Plan	x											x			
Biological Resources Measures															
General Wildlife Construction Measures			x		x							x			
Bald Eagle Conservation Plan					x							x			
Construction Aquatic Species Management and Monitoring Plan			x		x							x	x		
Invasive Weed Construction Measures				x	x						x	x			
Mesocarnivores Construction Measures					x							x			
Other Raptor Construction Measures					x							x			
Other Special-status Birds and Game Birds Construction Measures					x							x			
Riparian and Wetland Protection Measures			x	x	x						x	x			
Special-status Plant Construction Measure				x							x	x			

	Potentially Affected Resource														
Measure	**Water Use and Hydrology**	**Water Quality**	**Fish and Aquatic Resources**	**Botanical Resources**	**Wildlife Resources**	**Geology and Soils**	**Geomorphology**	**Land Use**	**Recreation Resources**	**Aesthetic Resources**	**Cultural Resources**	**Tribal Resources**	**Socioeconomics Resources**	**Environmental Justice**	**Marine Resources**
Cultural and Tribal Resources Measures															
Memorandum of Agreement (Known Historic Properties)												x			
Programmatic Agreement and Historic Properties Management Plan (HPMP)												x			
Fire Prevention and Suppression Measures															
Construction Fire Plan								x					x		
Hazardous Materials Measures															
Construction-related BMPs to control spills		x	x		x	x					x	x	x		x
Installation of sanitary facilities		x	x		x						x	x	x		x
Spill Prevention, Control, and Countermeasures (SPCC) Plan		x	x		x	x							x		x
Land Use Measures															
Construction-related BMPs to minimize disturbance			x	x	x	x	x	x					x		
Post-construction road rehabilitation/repair								x			x	x	x		
Water Quality and Erosion Control Measures															
Construction-related BMPs to reduce erosion and protect water quality		x	x		x	x	x					x	x		x

Measure	Water Use and Hydrology	Water Quality	Fish and Aquatic Resources	Botanical Resources	Wildlife Resources	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetic Resources	Cultural Resources	Tribal Resources	Socioeconomics Resources	Environmental Justice	Marine Resources
	Potentially Affected Resource														
Obtaining and implementing resource agency and construction permits		x	x		x	x	x					x	x		x
Construction Site Dewatering Plan	x	x	x		x						x	x	x		x
Construction Water Quality Monitoring Plan		x	x		x							x	x		x
Erosion Prevention Plan		x	x		x	x	x				x	x	x		x
Stormwater Pollution Prevention Plan (SWPPP)		x	x		x		x					x	x		x

References

FERC (Federal Energy Regulatory Commission). 1983. Order issuing new license, Form L-5. October 7.

FERC (Federal Energy Regulatory Commission). 2004. Order amending license. January 28.

PG&E (Pacific Gas and Electric Company). 2017. Potter Valley Hydroelectric Project, FERC Project No. 77, relicensing pre-application document. Volume 1: public information sections 1–7 and Volume 2: public information appendices A–G. April 2017.

PG&E (Pacific Gas and Electric Company). 2018. Potter Valley Hydroelectric Project, FERC Project No. 77, revised study plan. January 2018.

PG&E (Pacific Gas and Electric Company). 2023. Potter Valley Hydroelectric Project, FERC Project No. 77, initial draft surrender application and conceptual decommissioning plan. November 2023.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project

This Page Intentionally Left Blank

3.5.1.2 Water Use and Hydrology

This section describes the potential effects to water use and hydrology that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in water use and hydrology that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

Potential effects from accidental release of fuels or other hazardous materials associated with construction equipment or sedimentation from erosion and excavation that could impair water quality are addressed in Section 3.5.1.3, Water Quality, and Section 3.5.1.7, Geology and Soils.

The following potential effects to water use and hydrology resulting from construction of the New Eel-Russian Facility (NERF) were analyzed:

- Potential effects to water use and hydrology during construction

For the purposes of this section, the Analysis Area is limited to the NERF construction footprint, which includes the work and staging areas in the immediate vicinity of Cape Horn Dam and a limited area in and around the Potter Valley Powerhouse. The entire NERF construction footprint would be within the existing Federal Energy Regulatory Commission (FERC) Potter Valley Hydroelectric Project (Project) Boundary.

Potential Effects on Water Use and Hydrology during NERF Construction Activities

ERPA would construct the NERF retaining wall, install the conveyance pipe from the pump station to the tunnel inlet, add fill material behind the retaining wall, and construct the new pump station during the low-flow season (May–October) when the area is dewatered for deconstruction of Cape Horn Dam and associated facilities (Section 2.2.1, Surrender of License). All these activities would occur within the river immediately upstream of the existing Cape Horn Dam, on Project lands within the existing FERC Project Boundary. ERPA would install the energy dissipation valve at the Potter Valley Powerhouse during this same season. Installation of the valve would not affect potential release of flows through the powerhouse bypass system into the East Branch Russian River.

During construction of the NERF, natural Eel River flows would be routed through the bypass channel, around the construction area, and back into the Eel River channel downstream of the lower cofferdam installed to dewater the Cape Horn Dam Area. Flows from dewatering would be treated and released downstream of the lower cofferdam (refer to Section 2.2.1).[1] During NERF construction, ERPA may need to maintain dewatered conditions because of groundwater or rainfall for specific NERF construction activities in the NERF construction area. ERPA would implement a Construction Site Dewatering Plan, which would include measures to avoid any impacts to hydrology during this phase of construction (impacts to water quality are discussed in Section 3.5.1.3). Therefore, there would be no effects on hydrology in the Eel River during construction of the NERF facility.

Diversion of water to the East Branch Russian River during construction may occur via new temporary pumps installed upstream of the construction site.[2] If it is necessary for Pacific Gas and Electric Company (PG&E) to implement the East Branch Russian River Diversion Plan (see Section 2.2.3), NERF construction activities at the tunnel inlet would be coordinated with implementation of PG&E's plan, to assure that NERF construction activities at the tunnel inlet would not interfere with PG&E's ability to divert to the East Branch Russian River in compliance with the PG&E's East Branch Russian River Diversion Plan. During the license surrender proceeding, ERPA would develop a Construction East Branch Russian River Diversion Plan that would include measures for the coordination of NERF construction activities with PG&E's East Branch Russian River Diversion Plan. Any temporary and short-term cessation of diversions to the East Branch Russian River would have an adverse effect its hydrology.

Installation of the energy dissipation valve at the Potter Valley Powerhouse would not affect the ability to release flow through the powerhouse bypass system into the East Branch Russian River during construction.

Environmental Measures

To avoid or reduce effects to water use and hydrology during construction, ERPA would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Construction East Branch Russian River Diversion Plan
- Construction Site Dewatering Plan

Unavoidable Adverse Effects

Any temporary and short-term cessation of diversions to the East Branch Russian River during construction of the NERF would have an adverse effect its hydrology.

---

[1] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

[2] During construction, if the upstream cofferdam is required to be installed in the Eel River above the Van Arsdale Diversion, the diversion would not be operable and water diversions into the East Branch Russian River would cease. PG&E would implement the East Branch Russian River Diversion Plan that would include measures to continue providing water to the East Branch Russian River during construction (see Section 2.2.3).

TABLE OF CONTENTS

List of Acronyms

BMP	best management practices
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
Project	Potter Valley Hydroelectric Project
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan

This Page Intentionally Left Blank

3.5.1.3 Water Quality

This section describes the potential effects to water quality that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in water quality that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following are potential effects to water quality resulting from construction of the New Eel-Russian Facility (NERF):

- Potential increases in turbidity and suspended sediment
- Potential for water contamination from the accidental spill of oil, fuel, or other toxic materials
- Potential for water contamination and increases in pH during construction from stormwater runoff and erosion
- Potential for water contamination from the accidental spill of human waste

For the purposes of this section, the Analysis Area for effects to water quality includes the construction footprint areas at Cape Horn Dam and Potter Valley Powerhouse, shown in Section 2.2, Maps 2-11a and 2-11b, respectively.

Potential Increases in Turbidity and Suspended Sediment from NERF Construction Activities

Construction activities may cause a temporary increase in turbidity and suspended sediment in the Eel River downstream of the construction site due to NERF construction-related ground disturbance from excavation and earthmoving, clearing and grading, installation of access roads / river crossings, bank stabilization, and stormwater runoff. Erosion and destabilization of soils could also result from use of heavy equipment, personnel, and light vehicle traffic for the construction of the NERF, increasing the susceptibility of movement of soils into the Eel River. Diversion of water to the East Branch Russian River, if diverted, may occur upstream of the construction site (see Section 3.5.1.2), and water quality into the East Branch Russian River would not be affected by NERF construction activities if the diversion pumps are properly located, screened, and operated.

ERPA would include water quality and erosion control measures that would be implemented at the NERF construction activity locations described above. Construction measures include a Construction Site Dewatering Plan, Water Quality and Erosion Control Measures, a Construction Water Quality Monitoring Plan, construction best management practices (BMPs), and an Erosion Prevention Plan. In addition, ERPA would obtain applicable resource agency and construction permits and approvals. With these measures, the potential for increase in turbidity and suspended sediment and related water quality impacts are considered negligible in the Eel River and East Branch Russian River.

Potential for Water Contamination from Accidental Spills

NERF construction activities would include the use of a variety of chemicals such as fuels, lubricants, paints, solvents, and construction materials. Improper handling, storage, or accidental spills of these chemicals could result in pollutants entering soil or surface water if not managed correctly. Activities associated with NERF construction could increase the risk for accidental spills and pollutants to be introduced into the Eel River.

ERPA would implement Hazardous Materials Measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan, with protocols for preventing spills and managing incidents should they occur. In addition, ERPA would obtain applicable resource agency and construction permits. With adherence to the SPCC Plan, and construction-related BMPs and permits, potential effects from pollutant spill contamination from construction are reduced to a negligible level in the Eel River and East Branch Russian River.

Potential for Water Contamination and Increase in pH from Stormwater Runoff

NERF construction activities could temporarily alter natural drainage patterns. Without proper stormwater management practices such as silt fencing, straw/hay bales and wattles, or vegetative buffers, runoff from rainfall events could also transport pollutants from the construction site into the Eel River and potentially into the East Branch Russian River if construction activities affect the Eel River upstream of the diversion facility or pumps, if pumping is needed (see Section 3.5.1.2 for additional description of the potential pumping during construction). Without proper stormwater management practices runoff from rainfall events could contact curing concrete at the construction site and transport water with elevated pH into the Eel River and East Branch Russian River.

ERPA would include Water Quality and Erosion Control Measures that would be implemented at the construction activity locations described above. Construction measures include a Stormwater Pollution Prevention Plan (SWPPP), construction-related BMPs, and an Erosion Prevention Plan. In addition, ERPA would obtain applicable resource agency and construction permits. With these measures, the potential for contamination from stormwater runoff and related water quality impacts are considered negligible in the Eel River and East Branch Russian River.

Potential for Water Contamination from an Accidental Spill of Human Waste

NERF construction activities include installation of sanitary facilities (e.g., portable toilets) to support workers. Bacteria, nutrients, and other contaminants from human waste and sanitation systems can enter surface water or groundwater if the system is not properly designed and operated or if sanitation facilities are not provided.

ERPA would implement measures for containment of human waste that would be implemented at the construction activity locations described above. Construction measures include provision of portable toilets with secondary containment. In addition, ERPA would obtain applicable resource agency and construction permits. With these measures, the potential for contamination from human waste–related water quality impacts are considered negligible in the Eel River and East Branch Russian River.

Environmental Measures

To avoid or reduce effects to water quality during construction, ERPA would obtain, prepare, and/or implement the following measures and plans. These measures and plans would be applied during implementation of the Proposed Action. A complete list of construction measures is included in Section 2.2.3.

- Construction Site Dewatering Plan
- Construction Water Quality Monitoring Plan
- Water Quality and Erosion Control Measures
- BMPs
- Erosion Prevention Plan
- SWPPP
- Hazardous Materials Measures:
  - SPCC Plan
  - Construction-related BMPs
  - Required compliance with applicable local, state, and federal standards associated with handling and disposal of hazardous materials.
- Installation of sanitary facilities (with secondary containment).

Construction would also include obtaining and implementing resource agency and construction permits; following water quality BMPs; and complying with local, state, and federal laws (e.g., Basin Plan water quality requirements):

- United States Army Corps of Engineers Section 404 Clean Water Act Permit;
- State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification; and
- State Water Resources Control Board Construction General Permit/SWPPP.

Unavoidable Adverse Effects

No unavoidable adverse effects to water quality are expected from construction of the NERF.

TABLE OF CONTENTS

List of Acronyms

BMP	best management practices
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ERPA	Eel-Russian Project Authority
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FERC	Federal Energy Regulatory Commission
FR	Federal Register
FYLF	Foothill Yellow-Legged Frog
NERF	New Eel-Russian Facility
NMFS	National Marine Fisheries Service
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company
USACE	U.S. Army Corps of Engineers

This Page Intentionally Left Blank

3.5.1.4 Fish and Aquatic Resources

This section describes the potential effects to fish and aquatic resources that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in fish and aquatic resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following are potential effects to fish and aquatic resources resulting from construction of the New Eel-Russian Facility (NERF):

- Cape Horn Dam
  - Direct loss or disturbance of special-status and other aquatic species known to occur in the Project Area including Endangered Species Act (ESA) threatened California Coastal Evolutionarily Significant Unit (ESU) Chinook salmon (*Oncorhynchus tshawytscha*), ESA threatened Northern California Coastal Distinct Population Segment (DPS) steelhead (*O. mykiss*), foothill yellow-legged frog (FYLF) (*Rana boylii*), northwestern pond turtle (*Actinemys marmorata marmorata*), Pacific lamprey (*Entosphenus tridentatus*), western brook lamprey (*Lampetra richardsoni*), western river lamprey (*Lampetra ayresii*), and western pearlshell (*Margaritifera falcata*). Other native species are also present, such as benthic macroinvertebrates and native freshwater fish species (e.g., Sacramento sucker [*Catostomus occidentalis*]) (Section 3.3.3).
  - Changes in water quality.
  - Modification of critical habitat for Northern California Coastal DPS steelhead and California Coastal ESU Chinook salmon (Federal Register [FR] September 2, 2005 [70 FR 52488–52627] [Office of the Federal Register 2005]).
  - Modification of habitat for other aquatic species (FYLF, northwestern pond turtle, lamprey, freshwater mussels).
- Potter Valley Powerhouse
  - Changes in water quality (East Branch Russian River).

For the purposes of this section, the Analysis Area for fish and aquatic resources includes the NERF construction footprint areas at and upstream of Pacific Gas and Electric Company's (PG&E's) Cape Horn Dam and Potter Valley Powerhouse, shown in Section 2.2, Maps 2-11a and 2-11b, respectively; for water quality–related effects, the Action Area includes the Eel River and East Branch Russian rivers downstream of the construction areas.

Direct Loss or Disturbance of Aquatic Species

ESA threatened Chinook salmon and steelhead and other special-status aquatic species (e.g., FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) are known to occur in Van Arsdale Reservoir and the Eel River in the vicinity of Cape Horn Dam (Section 3.3.3). FYLF, northwestern pond turtle, and western pearlshell mussels are also present in the East Branch Russian River. During the May–October construction season, a variety of life stages (adult holding/rearing, juvenile rearing, spawning/reproduction, and migratory) could be present in the Analysis Area, except that spawning of threatened and endangered Chinook salmon and steelhead would occur during the late fall/winter/springtime period, outside the construction season.

Following installation of cofferdams and a river bypass system at Cape Horn Dam, the deconstruction area would be dewatered.[1] PG&E has analyzed the effects of the primary dewatering process and dam removal activities in Section 3.4.1 (Surrender of License), including rescue/salvage and relocation of aquatic species (e.g., fish, FYLF, northwestern pond turtle, and mussels). Following dewatering by PG&E, ERPA would remove/reposition sediment, construct the pump station, construct a retaining wall, construct a conduit from the pump station to the tunnel inlet, and fill the area behind the retaining wall. These activities would occur in the dry; therefore, riverine fish species, western pearlshell mussel, and other aquatic macroinvertebrates would not be present in the construction footprint following rescue/salvage and relocation[2] and would not be directly affected by NERF construction activities. During construction, ERPA could; however, directly affect individual mobile aquatic amphibians or aquatic reptiles (e.g., disturbance, mortality) if they re-enter the dewatered NERF construction area (e.g., FYLF, northwestern pond turtle).

ERPA would develop a Construction Aquatic Species Management and Monitoring Plan that would include pre-construction surveys,[3] periodic surveys during construction, environmental training and inadvertent discovery procedures for workers, and removal/relocation of aquatic species by qualified biologists. ERPA would also implement General Wildlife Measures that include measures that would avoid entrapment of amphibians and Riparian and Wetland Protection Measures that would require best management practices (BMPs) for work within and near aquatic habitats. The species that would most likely be affected would be terrestrially mobile, aquatic species such as FYLF and northwestern pond turtles. With implementation of a Construction

[1] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

[2] Rescue/salvage and relocation associated with the cofferdam installation and dewatering are components of PG&E's Surrender Application Proposed Action.

[3] The plan would define a process for coordination of pre-construction surveys if these surveys in NERF's construction area were completed by PG&E under components of PG&E's Surrender Application Proposed Action.

Aquatic Species Management and Monitoring Plan, and given the small size of the construction footprint, proposed construction activities would have negligible and temporary direct effects on special-status aquatic species and other native species.

Changes to Water Quality and Effects to Aquatic Species from NERF Construction

ESA threatened Chinook salmon and steelhead and other special-status aquatic species (e.g., FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) are known to occur in Van Arsdale Reservoir and the Eel River downstream of Cape Horn Dam (Section 3.3.3). FYLF, northwestern pond turtle, and western pearlshell mussels are also present in the East Branch Russian River. During the May–October construction season, a variety of life stages (adult holding/rearing, juvenile rearing, spawning/reproduction, and migratory) could be present in the Analysis Area, except that spawning of threatened and endangered Chinook salmon and steelhead would occur during the late fall/winter/springtime period, outside the construction season.

During construction of the NERF, ERPA could affect water quality in the Eel River in the vicinity of Cape Horn Dam and potentially in the East Branch Russian River below the Potter Valley Powerhouse if construction activities (e.g., staging areas) affect the Eel River upstream of the diversion facility or pumps, if pumping is needed (see Section 3.5.1.2 for additional description of the potential pumping during construction), which could affect fish and aquatic species. ERPA may need to use pumps to maintain dewatered conditions because of groundwater or rainfall for specific NERF construction activities in the NERF construction area. NERF construction activities, including dewatering, may temporarily increase turbidity and suspended sediment in the Eel River downstream of the construction area. NERF construction activities would also include the use of a variety of chemicals such as fuels, lubricants, paints, solvents, and construction materials. Improper handling, storage, or accidental spills of these chemicals could result in pollutants entering soil or surface water in the Eel River or East Branch Russian River, if not managed correctly. Construction activities could temporarily alter natural drainage patterns. Without proper stormwater management practices such as silt fencing, straw/hay bales, or vegetative buffers, runoff from rainfall events could also transport pollutants from the construction site into the Eel River and East Branch Russian River. Construction activities would include installation of sanitary facilities (e.g., portable toilets) to support workers. Bacteria, nutrients, and other contaminants from human waste and sanitation systems can enter surface water or groundwater if the system is not properly designed and operated or if sanitation facilities are not provided.

ERPA would include and adhere to a list of measures to protect water quality at the NERF construction sites (see Section 3.5.1.3 for additional discussion). These include a Construction Site Dewatering Plan, a Construction Water Quality Monitoring Plan, Water Quality and Erosion Control Measures, construction-related BMPs, an Erosion Prevention Plan, a Stormwater Pollution Prevention Plan, Hazardous Materials Measures, secondary containment of sanitary facilities, and compliance with local, state, and federal laws and construction permits. With these measures, the potential for contamination from stormwater runoff and affecting water quality would be negligible in the Eel River and East Branch Russian River (Section 3.5.1.3); therefore, the effects to aquatic species related to changes to water quality would also be negligible.

Modification of Aquatic Habitat

The Eel River downstream of Lake Pillsbury, including Van Arsdale Reservoir[4] and the NERF construction area, is critical habitat and essential fish habitat (EFH) for Northern California Coastal DPS steelhead and California Coastal ESU Chinook salmon.[5] Chinook salmon and steelhead are known to occur in or near the proposed NERF construction area. This area is used primarily as a migratory corridor and/or as rearing habitat. The NERF construction area is also habitat for other special-status species (FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) and native species such as benthic macroinvertebrates and native freshwater fish species (e.g., Sacramento sucker [*Catostomus occidentalis*]). At the NERF construction area, reservoir/riverine habitat is unremarkable for affected species except that it currently provides deepwater habitat, and as a result, has become a known hotspot for pikeminnow predation on juvenile salmonids.

Construction of the NERF would include removal/repositioning of riverine sediment to provide construction access, construction of the new pump station and ancillary facilities, construction of a concrete retaining wall within the channel, construction of a conduit from the pump station to the tunnel inlet, and placement of permanent fill behind the concrete retaining wall (stockpiled from dam removal and/or imported). These activities would occur in the dry following PG&E's dewatering of the work area. Construction of the NERF facilities would result in permanent fill of approximately 0.86 acre of reservoir/riverine habitat. This area would be converted from reservoir/river or floodplain habitat to upland habitat, and it would be protected by the retaining wall, and would no longer be critical habitat and EFH for steelhead and Chinook salmon or provide habitat for other aquatic species. Construction of the NERF would not affect volitional passage for migratory fish that would be provided in the river channel parallel to the concrete retaining wall.

Because various life stages of ESA threatened steelhead, Chinook salmon, and special-status species such as FYLF, northwestern pond turtle, lamprey spp., western pearlshell mussels, and native aquatic species (e.g., Sacramento sucker) are known to use existing aquatic habitat within the NERF construction footprint (refer to Surrender Application, Section 3.3.3), the fill of the river channel/floodplain (0.86 acre within Van Arsdale Reservoir) may result in an unavoidable adverse effect on critical habitat and EFH for steelhead and Chinook salmon and habitat for other special-status and native species. ERPA would obtain and comply with the following permits and compensatory mitigation requirements, if needed:

- Clean Water Act Section 401 permit
- U.S. Army Corps of Engineers (USACE) 404 permit is required to place fill material into waters of the United States.

---

4 The effects of dam deconstruction activities on habitat resulting from PG&E's removal of the Cape Horn Dam on habitat in the Analysis Area, inclusive of mitigation plans (e.g., Construction Aquatic Species Management and Monitoring Plan, Water Quality BMPs), are analyzed in Section 3.4.1.4 of the Surrender Application.

5 Following removal of Cape Horn Dam by PG&E (Section 3.4.1, Surrender of License), the area would likely provide relatively high-gradient riverine habitat. For example, before construction of Cape Horn Dam, a bedrock constriction occurred in this area. Riverine habitat would be of marginal quality for rearing and breeding of special-status species. See Section 3.4.1.4 for the analysis of the effects of Cape Horn Dam on aquatic habitat.

- Section 7(a)(2) of the ESA requires federal agencies (USACE) to consult with the National Marine Fisheries Service (NMFS) to ensure that actions they authorize or permit will not jeopardize the continued existence of listed species or adversely modify designated critical habitat (steelhead and Chinook salmon).
  - USACE would consult with NMFS to determine if the fill, retaining wall, and pumps "may affect" critical habitat.
  - Additional action may be required (e.g., Biological Assessment, Biological Opinion, compensatory mitigation).
  - The NMFS' issuance of a Biological Opinion would authorize adverse modifications to critical habitat and would include reasonable and prudent measures to minimize the effects of the Proposed Action on critical habitat, including compensatory mitigation for unavoidable adverse effects, as necessary.
- California Department of Fish and Wildlife 1600 permit

In addition, the NERF Engineering Design Report would include evaluations of the design (structural and mechanical), hydrology, hydraulics, and channel geomorphology to ensure the NERF would result in a geomorphologically stable channel and ensure that fish passage will occur at the deconstructed Cape Horn Dam and NERF facility over a wide range of flows. Implementation of these measures; and adherence to permit conditions and any required compensatory mitigation measures included in these permits would reduce potential impacts to sensitive species and their habitats; however, the placement of fill within 0.86 acre of critical habitat and EFH for ESA threatened California Costal ESU Chinook salmon and Northern California DPS steelhead and sensitive species habitat in the Eel River within Van Arsdale River may be an adverse effect.

Installation of the energy dissipation valve and instrumentation at the Potter Valley Powerhouse would occur within the existing powerhouse and maintenance yard; therefore, there would be no effect on special-status FYLF, northwestern pond turtle, and western pearlshell mussel habitat in the East Branch Russian River.

Environmental Measures

To avoid or reduce the effects to fish and aquatic resources during construction, ERPA would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- Construction Aquatic Species Management and Monitoring Plan
- General Wildlife Measures
- Riparian and Wetland Protection Measures
- Construction Site Dewatering Plan
- Construction Water Quality Monitoring Plan

- BMPs
- Erosion Prevention Plan
- Stormwater Pollution Prevention Plan
- Hazardous Materials Measures
  - Spill Prevention, Control, and Countermeasures Plan
  - Construction-related BMPs
  - Required compliance with applicable local, state, and federal standards associated with handling and disposal of hazardous materials
- Installation of sanitary facilities (with secondary containment)
- NERF Engineering Design Report that ensures channel design for fish passage over a wide range of flows.

Unavoidable Adverse Effects

The Proposed Action may result in:

- Permanent unavoidable adverse effect on critical habitat and EFH for ESA threatened California Costal ESU Chinook salmon and Northern California DPS steelhead within Van Arsdale Reservoir due to the placement of fill. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.
- Permanent unavoidable adverse effect on the habitat for other special-status species (FYLF, northwestern pond turtle, lamprey spp., and western pearlshell mussels) and native species (e.g., Sacramento sucker) within Van Arsdale Reservoir due to the placement of fill. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

References

Office of the Federal Register. 2005. Endangered and threatened species; designation of critical habitat for seven evolutionarily significant units of Pacific salmon and steelhead in California; final rule. Federal Register 70(170):52488–52627.

TABLE OF CONTENTS

List of Acronyms

BMP	best management practices
ERPA	Eel-Russian Project Authority
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
ft.	foot/feet
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company

This Page Intentionally Left Blank

3.5.1.5 Botanical Resources

This section describes the potential effects to botanical resources that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in botanical resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following are potential effects to botanical, riparian, and wetland resources resulting from construction of the New Eel-Russian Facility (NERF):

Botanical Resources

- Direct loss of special-status plant individuals or populations during NERF construction
- Indirect effects through loss or degradation of habitat, including the introduction or spread of invasive weeds, during construction

Riparian and Wetland Resources

- Direct reduction in the amount of riparian habitat or effects to riparian plant species (e.g., through trimming or removal) during NERF construction
- Indirect effects through the introduction or spread of invasive weeds during construction
- Indirect effects to riparian and wetland habitats resulting from degradation of water quality following PG&E's removal of cofferdams (completed as part of the Surrender Application, Section 2.2) and from potential hazardous material spills during NERF construction activities

A discussion of potential effects to botanical resources that could occur as a result of implementation of the Proposed Action, with incorporation of NERF construction measures, is provided below.

Botanical Resources

This section presents an evaluation of potential effects of NERF construction activities on botanical resources, including plant species listed under the federal or state Endangered Species Act (ESA). This includes potential direct and indirect effects to special-status plants (including effects from introduction or spread of invasive weeds). Refer to Section 3.3.4, Table 3.3.4-2, for a list of special-status plants known to occur or potentially occurring in the Analysis Area and their status and habitat requirements. Section 3.3.4, Table 3.3.4-4, provides a list of invasive weed populations identified in the Analysis Area. Refer to Section 3.3.4, Maps 3.3.4-2a–i and Map 3.3.4-3, for the location of known populations of special-status plants and invasive weeds, respectively, in relation to the Analysis Area.

The baseline Analysis Area for this section includes the NERF construction areas, which consist of the following:

- Potter Valley Powerhouse Construction Area (Section 2.2, Map 2-11b)
- New Pump Station Construction Area at Cape Horn Dam (Section 2.2, Map 2-11a)

For the purposes of this analysis, a special-status plant is defined as a species listed, proposed, or under review as rare, threatened, or endangered by the federal or state government and/or those on the California Department of Fish and Wildlife Special Vascular Plants, Bryophytes, and Lichens List with a California Rare Plant Rank of 1 or 2.

For the purposes of this analysis, invasive weeds are those rated by the California Department of Food and Agriculture as A, B, or on the California Code of Regulations 4500 Noxious Weed List.

Direct Loss of Special-status Plant Individuals or Populations during Construction

NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to the installation of an energy dissipation valve and associated instrumentation in a fully developed site (Map 2-11b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, there would be no direct or indirect effects to special-status plants or other habitat from minor construction activities at the Potter Valley Powerhouse Construction Area.

Suitable habitat is present for 20 special-status plants that may potentially occur in uplands and six special-status plants that may potentially occur in riparian areas and/or wetlands. There are no ESA-listed plant species with potential to occur. No special-status plants were observed within the New Pump Station Construction Area during comprehensive botanical surveys conducted in 2018 (PG&E 2019).

The use of heavy equipment or placement of stockpiled material could crush or bury special-status plant individuals, if present in active work areas. To address and reduce the potential for direct effects to special-status plant populations, ERPA will implement the Special-status Plant Construction Measures. These measures require ERPA to implement a special-status plant survey (during the blooming season) within a 100-foot (ft.) buffer of the New Pump Station Construction Area in the year prior to NERF construction. If special-status plant populations are found, ERPA will flag populations with a 25-ft. buffer prior to ground-disturbing construction activities or will implement site-specific measures considering the life history of the special-status plant species. Examples of site-specific measures may include, but are not limited to, implementing work following the seed set and senescence of annual plants or during the dormant phase of perennial plants. In the unlikely event that a special-status plant becomes established in the riparian area that will be permanently filled as part of the Proposed Action, ERPA will consult with resource agencies to determine, based on species present, options for seed collection or transplanting individuals to an agency-approved site to address and reduce direct effects to individuals. In addition, ERPA would implement General Construction Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and minimization measures. Refer to Section 2.2.3, Table 2-15, for the full language of these measures.

With implementation of NERF construction measures, construction would have temporary and/or negligible direct effects on special-status plants in the New Pump Station Construction Area.

Indirect Effects through Loss or Degradation of Habitat, including the Introduction or Spread of Invasive Weeds, during Construction

As described previously, NERF construction activities within the Potter Valley Powerhouse Construction Area would take place within a fully developed site. Therefore, there would be no indirect effects to special-status plants in the Potter Valley Powerhouse Construction Area.

Potential indirect effects to special-status plants in the New Pump Station Construction Area include degradation of habitat from ground disturbance and the spread or introduction of invasive weed populations.

NERF construction activities will require ground disturbance and use of heavy equipment, which could potentially result in destabilization and erosion of soils within the work areas. Effects to soil stability could potentially degrade habitat for native vegetation, including special-status plants. Indirect effects to special-status plants would be short-term and temporary. Therefore, any effects to special-status plants in the New Pump Station Construction Area would be negligible.

Five invasive weed species—including ripgut brome (*Bromus diandrus*), cheatgrass (*Bromus tectorum*), bull thistle (*Cirsium vulgare*), perennial pepperweed (*Lepidium latifolium*), and Himalayan blackberry (*Rubus armeniacus*)—are known to occur in the Analysis Area (Section 3.3.4, Map 3.3.4-3).

Transport of ground-disturbing construction vehicles and equipment to construction work, access, staging, and stockpile areas, as well as foot traffic associated with NERF construction activities, could result in the spread of previously established invasive weed populations or introduce new invasive weed populations into the NERF construction areas. The potential for the introduction or spread of invasive weeds will be addressed and reduced through implementation of the Invasive Weed Construction Measure. This measure requires ERPA to conduct invasive weed surveys in conjunction with special-status plant surveys (during the blooming season) the year before construction. During NERF construction, ERPA will implement measures to prevent the spread or introduction of invasive weeds, such as cleaning off-road equipment to ensure it is free of soil and plant parts prior to arrival at the construction sites; minimizing soil disturbance as much as possible; driving and parking on established roads to the extent possible; maintaining gravel and spoil piles in a weed-free state; using weed-free areas for staging and laydown; properly containing and transporting any invasive weed–infested materials to a landfill; using certified weed-free erosion control materials; restoring sites with a native seed mix; seeding topsoil stockpiles with a native seed mix if left for longer than a month; cleaning clothing, footwear, and gear before moving from an infested area to a non-infested area; and avoiding invasive weed–infested areas or prioritizing activities such that invasive weed–infested areas are worked in last. ERPA will also implement the General Construction Measures that limit the location and extent of ground-disturbing work activities and require contractors and staff to attend trainings to comply with site-specific avoidance and protection measures. Refer to Section 2.2.3, Table 2-15, for the full language of these measures.

With implementation of NERF construction measures, indirect effects to special-status plants in the New Pump Station Construction Area from the spread or introduction of invasive weeds would be negligible.

Riparian and Wetland Resources

This section presents an evaluation of potential direct and indirect effects of NERF construction activities on riparian and wetland resources. Refer to Section 3.3.4.4 for a description of riparian and wetland resources in the Analysis Area. Refer to Figure 3.3.4-2 for a preliminary map of wetlands along the shoreline of Van Arsdale Reservoir.

The baseline Analysis Area for this section includes the NERF construction areas.

<u>Direct Reduction in the Amount of Riparian Habitat or Effects to Riparian Plant Species (e.g., through Trimming or Removal) during Construction</u>

NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2-11b). There is no riparian habitat present within the Potter Valley Powerhouse Construction Area, and aquatic features are limited to the Potter Valley Powerhouse tailraces and the Venturi flume that are located south of the construction area (behind the Potter Valley Powerhouse). Therefore, no direct effects to riparian and/or wetland habitats from minor construction activities at the Potter Valley Powerhouse Construction Area would occur.

Stillwater Sciences identified a forested emergent wetland (i.e., riparian habitat) (PG&E 2019) along the western bank of Van Arsdale Reservoir and Cape Horn Dam in the New Pump Station Construction Area (refer to Section 3.3.4, Figure 3.3.4-2). The New Pump Station Construction Area encompasses a small portion of the historical inundation zone of Van Arsdale Reservoir, between the former Cape Horn Dam and the Van Arsdale Fish Screen Facility, and a small riparian area classified by Stillwater Sciences as forested wetland (Section 3.3.4.4, PG&E 2019) located on the west bank of the former reservoir (Section 2.2, Map 2-11a). Vegetation removal and ground disturbance associated with the construction of the new concrete retaining wall and associated fill would result in the permanent removal of 0.09 acre of this riparian habitat and 0.86 acre of fill within jurisdictional waters of the U.S. in Van Arsdale Reservoir. To reduce effects to riparian habitats, ERPA would implement the Riparian and Wetland Protection Measures, which require that riparian vegetation removal be limited to the extent possible and that riparian vegetation outside of immediate construction work areas be flagged for avoidance. Refer to Section 2.2.3, Table 2-15, for the full language of these measures. ERPA would also obtain Clean Water Act Section 404/401 permit/certification and implement all associated conditions, including any riparian protection and mitigation measures. With implementation of the Riparian and Wetland Protection Measures, effects from riparian vegetation removal would be considered negligible.

Indirect Effects to Riparian and Wetland Habitats Resulting from Introduction or Spread of Invasive Weeds during Construction

As described previously, the Potter Valley Powerhouse Construction Area is entirely contained within a previously developed site; therefore, there would be no indirect effects to riparian/wetland habitat.

As described above for botanical resources, there are five invasive weeds known to occur in the New Pump Station Construction Area. NERF construction activities could potentially result in the spread of existing invasive weeds or introduce new invasive weeds into the construction area, which could result in the degradation of riparian and wetland habitats in the New Pump Station Construction Area. To address and reduce these potential effects, ERPA will implement the Invasive Weed Construction Measures and General Construction Measures as described above for botanical resources. Refer to Section 2.2.3, Table 2-15 for the full language of these measures. With implementation of these measures, potential indirect effects to riparian and wetland habitats from invasive weeds would be considered negligible.

Indirect Effects to Riparian and Wetland Habitats Resulting from Degradation of Water Quality, Increased Erosion, and Hazardous Material Spills Potentially Resulting from Construction Activities

As described previously, the Potter Valley Powerhouse Construction Area is entirely contained within a previously developed site; therefore, there would be no indirect effects to riparian/wetland habitat.

Use of ground-disturbing heavy equipment during implementation of the NERF construction activities could result in temporary degradation of water quality in the Eel River following PG&E's removal of cofferdams[1] (completed as part of the Surrender Application, Section 2.2) through the potential release of hazardous materials including fuels or other chemicals from NERF construction equipment. Such effects to water quality could degrade riparian and wetland habitats. The potential for construction-related degradation of water quality would be addressed and reduced through implementation of the Water Quality and Erosion Control Construction Measures (as described in Section 3.5.1.3, Water Quality) and applicable best management practices (BMPs). In addition, ERPA will implement the Riparian and Wetland Protection Measures, which require ERPA to implement BMPs for work within and near aquatic habitats. Such BMPs may include prohibiting equipment refueling within 100 ft. of wetlands, streams, or waterways; using

[1] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

secondary containment; providing spill kits onsite; and using appropriate erosion control materials. ERPA would also obtain coverage under Clean Water Act Section 404/401 permits and comply with all included conditions. Refer to Section 2.2.3, Table 2-15 for the full language of these measures. With implementation of these construction measures, potential effects to riparian and wetland habitats from degradation of water quality would be negligible.

Construction and Environmental Measures

To avoid or reduce effects to botanical resources during NERF construction, ERPA will obtain, prepare, and/or implement the following measures. A complete list of NERF construction measures is included in Section 2.2.3.

- General Construction Measures
- Special-status Plant Construction Measures
- Riparian and Wetland Protection Measures

Unavoidable Adverse Effects

There are no unavoidable adverse effects to special-status plants or riparian or wetland resources from construction of the NERF.

References

Pacific Gas & Electric Company (PG&E). 2019. TERR 1 – Botanical Resources Study Data Memorialization, Technical Study Summary. Potter Valley Hydroelectric Project (FERC Project No. 77 Relicensing).

TABLE OF CONTENTS

List of Acronyms

BCC	Bird of Conservation Concern
BMP	best management practice
CFP	California Fully Protected
Eagle Act	Bald and Golden Eagle Protection Act
ERPA	Eel-Russian Project Authority
FD	Federal Delisted
FERC	Federal Energy Regulatory Commission
FSS	Forest Service Sensitive
ft.	foot/feet
GIS	Geographic Information System
mi.	mile(s)
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas & Electric Company
Project	Potter Valley Hydroelectric Project
SSC	California Species of Special Concern
ST	State Threatened
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Department of Agriculture – Forest Service

This Page Intentionally Left Blank

3.5.1.6 Wildlife Resources

This section describes the potential effects to wildlife resources that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the impacts to wildlife resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following are potential effects to wildlife resources resulting from construction of the New Eel-Russian Facility (NERF):

- Potential effects to special-status invertebrate species, including monarch butterfly (*Danaus plexippus;* Federal Proposed Threatened [FPT]), and western bumble bee (*Bombus occidentalis*; Forest Service Sensitive [FSS], State Candidate Endangered [SCE]):
  - Direct effects to breeding or foraging individuals during NERF construction; and
  - Indirect effects through the reduction or degradation of habitat resulting from removal of floral resources or the introduction of invasive weeds during NERF construction.
- Potential effects to bald eagle (*Haliaeetus leucocephalus*; Federal Delisted [FD], Bald and Golden Eagle Protection Act [Eagle Act], FSS, State Endangered [SE], California Fully Protected [CFP]):
  - Direct effects to active nests or disturbance of foraging individuals during NERF construction and potential construction-related helicopter use; and
  - Indirect effects through degradation of water quality within aquatic habitats immediately downstream of the NERF construction area.
- Potential effects to northern spotted owl (*Strix occidentalis caurina*; Federal Threatened, FSS, State Threatened [ST], California Species of Special Concern [SSC]):
  - Direct effects to activity centers; and
  - Indirect effects through the loss or degradation of nesting habitat.

- Potential effects to other raptors:
  - Direct effects to active nests or disturbance of foraging individuals during NERF construction and potential construction-related helicopter use;
  - Indirect effects through the loss or degradation of nesting habitat; and
  - Indirect effects through degradation of water quality within aquatic habitats for aquatic-foraging raptors.
- Potential effects to other special-status birds, common birds, and game birds:
  - Direct effects to active nests during removal of vegetation and NERF construction activities;
  - Indirect effects through the loss or degradation of nesting habitat; and
  - Indirect effects through degradation of water quality within aquatic habitats for aquatic-foraging birds.
- Potential effects on special-status bat species:
  - Direct effects from potential disturbance of bat roosts in the NERF construction area;
  - Indirect effects through degradation of aquatic foraging habitat; and
  - Indirect effects through the loss or degradation of roosting habitat.
- Potential effects to mesocarnivores:
  - Direct disturbance of individuals during NERF construction activities; and
  - Potential vehicle collisions with NERF construction vehicles.
- Potential effects to tule elk (*Cervus elaphus nannodes*) or other game mammals:
  - Direct disturbance of individuals during NERF construction activities.

Effects on Wildlife Resources

This section presents an evaluation of the potential effects of NERF construction activities on wildlife resources, including species listed under the Endangered Species Act, as well as other special-status wildlife and game species. For this analysis, species have been grouped to include taxonomically similar species, including special-status invertebrates, bald eagle, northern spotted owl (*Strix occidentalis caurina*), other raptors, other special-status and common birds and game birds, special-status bats, special-status mesocarnivores, and tule elk and other game mammals. Refer to Section 3.3.5, Table 3.3.5-3, for a list of special-status wildlife species known to occur or potentially occurring in the Analysis Area, as well as their status and habitat requirements. Section 3.3.5, Table 3.3.5-6, provides a list of resident and migratory game species potentially occurring in the Analysis Area.

The baseline Analysis Area for this section includes the NERF construction areas, which consist of the following:

- New Pump Station Construction Area (Section 2.2, Map 2-11a)
- Potter Valley Powerhouse Construction Area (Section 2.2, Map 2-11b)

The baseline Analysis Area varies depending on the biology of wildlife species and is therefore further defined under each section below, where applicable.

Potential Effects on Special-status Invertebrates

The Analysis Area for special-status invertebrates is the New Pump Station Construction Area (Section 2.2, Map 2-11a). NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2.11-b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, there would be no direct or indirect effects to special-status invertebrates or their habitat from minor construction activities at the Potter Valley Powerhouse Construction Area.

Provided below is a discussion of potential direct and indirect effects to special-status invertebrates and their habitats in the New Pump Station Construction Area.

New Pump Station Construction Area

Both monarch butterfly (*Danaus plexippus*) (FPT) and western bumble bee (*Bombus occidentalis*) (FSS, SCE) may potentially occur in the New Pump Station Construction Area. Milkweed (*Asclepias* spp.) and rodent burrows, if present, may provide suitable breeding and foraging habitat for these species. Floral resources located in the proposed construction area at the New Pump Station Construction Area may provide foraging habitat for both species. Provided below is a discussion of potential direct effects to special-status invertebrate individuals from construction activities, as well as indirect effects to habitat.

Direct Effects

The NERF construction area encompasses a small portion of the historical inundation zone of Van Arsdale Reservoir (between the former Cape Horn Dam and the Van Arsdale Fish Screen Facility) and a small riparian area (e.g., forested wetland as classified by Stillwater Sciences [PG&E 2019]; refer to Section 3.3.4.4) located on the west bank of the former reservoir (Appendix 3.3.4-B, Map 2) within the construction and dewatering area for decommissioning of PG&E's Potter Valley Project (Project) facilities and features at Cape Horn Dam. Vegetation removal, ground disturbance, and placement of fill would result in removal of 0.09 acre of this riparian vegetation. Removal of this riparian vegetation could result in localized effects to monarch butterfly (if milkweed host plants are present) and western bumble bee (if rodent burrows are present) breeding, including disturbance (i.e., flushing or displacement) and/or removal of larvae. Milkweeds often grow in upland habitats, but a search of Calflora (2024) indicated that showy milkweed (*Asclepias speciosa*), which sometimes grows in wetland and riparian habitats, has one occurrence in the vicinity of Van Arsdale Reservoir.

To address and reduce potential effects to monarch butterfly and western bumble bee breeding, ERPA would implement General Construction Measures, which restrict ground disturbance to designated areas; require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures; and implement General Wildlife Construction Measures, which require any observations of special-status species that were previously undiscovered to be reported to ERPA as soon as practicable. Refer to Section 2.2.3, Table 2-15, for the full language of NERF construction measures to be implemented to address and reduce direct effects to special-status invertebrates.

Foraging habitat for monarch butterfly and western bumble bee is more general than breeding habitat and consists of flowering plants of a wide variety of species. Therefore, trimming or removal of vegetation could potentially result in disturbance (i.e., flushing or displacement) of butterflies and bees, if foraging in the vicinity. Flushing or displacement of foraging individuals would be short-term and temporary and would cease upon completion of the activity.

With implementation of NERF construction measures, proposed construction activities in the New Pump Station Construction Area would have negligible and temporary direct effects on special-status invertebrates.

Indirect Effects

As described previously, while construction work, access, staging, and stockpile areas are mostly located within a small portion of the historical inundation zone of Van Arsdale Reservoir that does not support abundant floral resources for special-status invertebrates, removal of 0.09 acre of riparian vegetation on the west bank of Van Arsdale Reservoir would be required. Removal of vegetation would result in a minor decrease in potential habitat available for foraging butterflies and a decrease in potential breeding habitat for monarch butterflies, if milkweed is removed. Removal of vegetation would also result in a minor decrease in potential habitat available for foraging western bumble bees. To address and reduce effects of vegetation removal/trimming, ERPA would implement General Construction Measures and General Wildlife Construction Measures. In addition, implementation of the Riparian and Wetland Protection Measures would protect floral resources that may be present in riparian areas in or directly adjacent to the construction area that would not be removed as part of construction of the new pump station and associated facilities. Refer to Section 2.2.3, Table 2-15, for the full language of NERF construction measures to be implemented to address and reduce effects to special-status invertebrates.

In addition, importation and use of construction vehicles and equipment, and foot traffic associated with NERF construction activities, could degrade native plant habitat for special-status invertebrates through the introduction or spread of invasive weeds. To address and reduce the potential for the introduction or spread of invasive weeds, ERPA would implement the Invasive Weed Construction Measures, which requires pre-construction invasive weed surveys; cleaning of equipment prior to transport to NERF construction work areas; minimizing soil disturbance to the extent possible; utilizing existing roads; maintaining gravel and spoil piles free of invasive weeds and using weed-free areas for staging and laydown; use of certified weed-free erosion control materials; seeding stockpiles with native seed mixes; cleaning clothing, footwear, and gear before moving from an infested area to a non-infested area; and avoiding working in invasive weed-infested areas or prioritizing activities so that infested areas are worked last. Refer to Section 2.2.3, Table 2-15, for the full language of NERF construction measures. Implementation of the Invasive Weed Construction Measures would address and reduce the potential for the introduction or spread of invasive weeds that could degrade habitat for special-status invertebrates.

With implementation of NERF construction measures, proposed NERF construction activities in the New Pump Station Construction Area would have negligible indirect effects on special-status invertebrates.

Potential Effects to Bald Eagle

Bald eagles in California typically nest in large conifers located within 1 mile (mi.) of large bodies of water that provide aquatic foraging habitat (Jackman and Jenkins 2004). Therefore, the Analysis Area for bald eagles includes a 1-mi. buffer around the New Pump Station Construction Area (Section 2.2, Map 2-11a).

As described above, NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2-11b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, and the nearest known occurrence of bald eagle or nest site is more than 2 mi. away, there would be no direct or indirect effects to bald eagle from minor construction activities at the Potter Valley Powerhouse Construction Area.

Provided below is a discussion of potential direct and indirect effects to bald eagle and its habitat in the New Pump Station Construction Area.

<u>New Pump Station Construction Area</u>

There is one active bald eagle territory at Van Arsdale Reservoir within 1 mi. of the New Pump Station Construction Area (refer to Section 3.3.5, Map 3.3.5-2b). The most recent active nest is located 0.5 mi. from the New Pump Station Construction Area (PG&E 2023), but an alternate nest used in previous years is located near the Eel River and Cape Horn Dam (PG&E 2021, 2022). Forested habitats surrounding the reservoir provide suitable nesting habitat, and the Eel River downstream of the former Cape Horn Dam site provides suitable foraging habitat. Provided below is a discussion of potential direct effects to bald eagle individuals from NERF construction activities in the New Pump Station Construction Area, as well as indirect effects to habitat.

Direct Effects

The noise from construction equipment, human presence, and helicopter use could result in disturbance effects to bald eagle nesting or foraging. Tree removal may also result in disturbance to eagles.

Construction activities in the New Pump Station Construction Area would take place from May to October, which partially overlaps the bald eagle nesting season, (January 1–August 1, Jackman and Jenkins 2004). Bald eagles display varying sensitivities to noise depending on the type of activity. Some construction noise (e.g., including increased helicopter use) has the potential to cause nest disturbance and/or failure and could result in the abandonment of eggs, nestlings, and/or fledglings.

Construction of the new pump station may require helicopter use. Compared to the existing condition, wherein helicopter use is infrequent, this could represent increased potential for disturbance along the helicopter route. A literature review completed by Anderson (2007) compares data from various studies on the response of raptors (including eagles, peregrine falcon [*Falco peregrinus anatum*], osprey [*Pandion haliaetus*], and red-tailed hawk [*Buteo jamaicensis*]) to disturbance and noise from helicopters. In the studies reviewed, helicopters elicited a disturbance response (e.g., flushing from nest) more frequently than fixed-wing aircraft; however, adults were typically flushed from nests only when helicopters approached closely or hovered for longer periods of time. A sudden or surprise approach may elicit a stronger response from adult raptors at nests than a gradual approach (White and Sherrod 1973).

To address and reduce the disturbance of nesting bald eagles during NERF construction to the extent possible, ERPA would implement a Bald Eagle Conservation Plan. The plan would restrict removal of trees (24 inches in diameter breast height (DBH) or greater) to outside the nesting season (i.e., September 1–December 31) to avoid effects to nesting bald eagles. In addition, the Bald Eagle Conservation Plan requires a nest survey prior to construction, implementation of Geographic Information System (GIS) analysis to determine the location of nests in relation to the location and timing of NERF construction activities, including helicopter flight paths and heavy equipment use, and determining whether nests fall within the United States (U.S.) Fish and Wildlife Service (USFWS)–recommended no-disturbance buffers. The *National Bald Eagle Management Guidelines* (USFWS 2007) recommend implementation of the following activity-specific non-disturbance buffers between January 1 and August 1 to avoid impacts to nesting bald eagles:

- 1,000-foot (ft.) no-disturbance buffer (horizontal/vertical) for helicopters and fixed-wing aircraft; and
- 660-ft. no-disturbance buffer for use of heavy equipment and general construction activities.

Based on the results of the analysis described above, the following avoidance and protection measures would apply:

- If bald eagle nests are found within the non-disturbance buffer of the New Pump Station Construction Area, ERPA would modify helicopter flight paths and the timing of construction activities to the extent possible. However, the timing of construction of the new pump station is tied to the construction period for removal of Cape Horn Dam that has been timed to address and reduce effects to aquatic resources in the Eel River downstream. Because these time periods may overlap with the bald eagle nesting season (January 1–August 31), nest disturbance may be unavoidable. Through development of the Bald Eagle

Conservation Plan and consultation with USFWS under the Bald and Golden Eagle Protection Act, measures to avoid and reduce potential disturbance would be further developed and implemented as part of the Proposed Action to protect bald eagles.

With implementation of the Bald Eagle Conservation Plan, as well as General Construction Measures and General Wildlife Construction Measures that provide environmental training and inadvertent discovery procedures, adverse direct effects to bald eagle would be reduced.

However, NERF construction may potentially result in nest disturbance, failure, and/or abandonment, if bald eagles are nesting within the no-disturbance buffers of the New Pump Station Construction Area and construction activities cannot be modified to avoid disturbance during the nesting season. Therefore, implementation of the Proposed Action may result in significant adverse effects to bald eagle nesting near the construction area. ERPA would consult with USFWS to determine the necessity for issuance of take authorization for potentially significant and unavoidable adverse effects to breeding bald eagles. Refer to Section 2.2.3, Table 2-15, for the full language of the Bald Eagle Conservation Plan.

Indirect Effects

NERF construction activities may also result in indirect effects to bald eagle nesting and foraging habitat. The placement of fill material behind the retaining wall would require removal of 0.09 acre of riparian vegetation. Bald eagles preferentially select the largest and tallest trees in a stand for nesting or perching (Jackman and Jenkins 2004). If large and tall trees are present, tree removal could result in a minor reduction in bald eagle roosting or nesting habitat. However, as specified in the Riparian and Wetland Protection Measures, ERPA would obtain all necessary permits for removal of the riparian habitat and implement permit conditions, including any required riparian mitigation, as part of the Proposed Action. The remaining construction areas (i.e., work areas, access routes, staging, and stockpile areas) are primarily located within a portion of the historical inundation zone of Van Arsdale Reservoir and do not provide nesting habitat for bald eagle. Therefore, effects to nesting habitat would be considered negligible.

NERF construction activities may potentially affect foraging habitat for bald eagles. Use of ground-disturbing heavy equipment during implementation of NERF construction could result in temporary degradation of water quality in the Eel River immediately downstream following PG&E's removal of cofferdams completed as part of the Surrender Application (Section 2.2) through the potential release of hazardous materials including fuels or other chemicals. Such effects to water quality could degrade aquatic habitats. Degradation of water quality could, in turn, affect fish that represent prey species for foraging bald eagles. The potential for construction-related degradation of water quality would be addressed and reduced through implementation of the water quality construction measures (as described in Section 3.5.1.3 – Water Quality), and applicable Best Management Practices (BMPs). In addition, ERPA would implement the Riparian and Wetland Protection Measures, which requires ERPA to implement BMPs for work within and near aquatic habitats. Such BMPs may include prohibiting refueling of equipment within 100 ft. of wetlands, streams, or waterways; using secondary containment; providing spill kits onsite; and using appropriate erosion control materials. ERPA would also obtain coverage under Clean Water Act Section 404/401 permits and comply with all conditions of the permits. With implementation of these construction measures, potential effects to aquatic foraging habitat from degradation of water quality would be negligible. Refer to Section 2.2.3, Table 2-15, for the full language of these measures.

Therefore, with implementation of NERF construction measures, proposed construction activities would have negligible indirect effects on bald eagles.

Potential Effects to Northern Spotted Owl

The Analysis Area for northern spotted owl (Federal Threatened, FSS, State Threatened [ST], California Species of Special Concern [SSC]) is defined as a 1-mi. buffer from the boundaries of the New Pump Station Construction Areas (Section 2.2, Map 2-11a). This Analysis Area encompasses the largest buffer imposed by USFWS for the minimization of disturbance effects to northern spotted owl.

As described above under the section for bald eagle, NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2-11b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, and the nearest northern spotted owl activity center and USFWS-designated critical habitat is more than 4 mi. away, there would be no direct or indirect effects to northern spotted owl from minor construction activities at the Potter Valley Powerhouse Construction Area.

Provided below is a discussion of potential direct and indirect effects to northern spotted owl and its habitat in the New Pump Station Construction Area.

New Pump Station Construction Area

There is no USFWS-designated critical habitat or known northern spotted owl activity centers within 1 mi. of the New Pump Station Construction Area (USFWS 2012). There are also no known observations of northern spotted owl in the construction area (CNDDB 2024). While some suitable habitat was mapped as part of studies in 2018 (PG&E 2019), habitat in this location is patchy and is therefore unlikely to support nesting (refer to Section 3.3.5, Map 3.3.5-3b). Therefore, there would be no direct effects to northern spotted owl from implementation of the Proposed Action.

Provided below is a discussion of potential indirect effects to northern spotted owl in the New Pump Station Construction Area.

Indirect Effects

There is no suitable breeding habitat for northern spotted owl in the New Pump Station Construction Area; therefore, NERF construction would not affect breeding habitat. Placement of fill material west of the former Van Arsdale Reservoir to allow for construction of the new pump station would require removal of 0.09 acre of riparian vegetation. Northern spotted owls select later seral forest edges where their primary prey is available for foraging, and there is little evidence that they forage in riparian areas (Forsman et al. 2004). The construction area (i.e., work areas, access routes, staging, and stockpile areas) is mostly located within a small portion of the former Van Arsdale Reservoir that also does not represent foraging habitat for northern spotted owl. Therefore, there would be no effect to nesting or foraging habitat for northern spotted owl.

Potential Effects to Other Raptors

Raptor species that are known to occur in the vicinity of the New Pump Station and Potter Valley Powerhouse construction areas include northern (American) goshawk (*Accipiter gentilis* [*Astur atricapillus*]) (FSS, SSC), American peregrine falcon (FD, State Delisted, CFP), and osprey (State Watchlist). Raptor species for which suitable habitat is present and the species may potentially occur include the golden eagle (*Aquila chrysaetos*) (Eagle Act, CFP), short-eared owl (*Asio flammeus*) (Bird of Conservation Concern [BCC], SSC), long-eared owl (*Asio otus*) (BCC, SSC), and northern harrier (*Circus hudsonius*) (BCC, SSC). Common raptor species (e.g., red-tailed hawk, red-shouldered hawk [*Buteo lineatus*], and Cooper's hawk [*Accipiter cooperi*]) are also known to nest and forage in the Project vicinity.

The Analysis Area for other raptors is defined as a 1-mi. buffer from the boundaries of the New Pump Station Construction Area (Section 2.2, Map 2-11a). As described above, NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2-11b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, there would be no direct or indirect effects to raptors from construction at the Potter Valley Powerhouse Construction Area.

Provided below is a discussion of potential direct and indirect effects to other raptors and their habitat.

New Pump Station Construction Area

Osprey are known to occur in the New Pump Station Construction Area, and suitable habitat is also present for northern (American) goshawk, golden eagle, American peregrine falcon (foraging), short-eared owl, long-eared owl, northern harrier, and other common raptor species in the Analysis Area. A discussion of potential direct effects and indirect effects is provided below.

Direct Effects

Noise from construction equipment, human presence, and helicopter use could result in disturbance effects to raptors foraging or nesting in the Analysis Area. Riparian removal could also directly affect raptors. Construction activities in the New Pump Station Construction Area would take place May–October when Van Arsdale Reservoir is dewatered and the Eel River is routed around the construction area. Dewatering of Van Arsdale Reservoir would be completed as part of the Proposed Action under the Surrender Application. This construction period partially overlaps with the breeding season for special-status raptors that are known to occur in the Analysis Area, which is typically between February 15 and September 15 for northern (American) goshawk, February 15 and July 31 for American peregrine falcon, and March 15 and August 31 for osprey.

Construction of the new pump station may require helicopter use during the construction period. Compared to the existing condition, wherein helicopter use is infrequent, this represents increased potential for disturbance along the helicopter route. A literature review completed by Anderson (2007) compares data from various studies on the response of raptors (including eagles, peregrine falcon, osprey, and red-tailed hawk) to disturbance and noise from helicopters. In the studies reviewed, helicopters elicited a disturbance response (e.g., flushing from nest) more frequently than fixed-wing aircraft; however, adults were typically flushed from nests only when helicopters approached closely or hovered for longer periods of time. A sudden or surprise approach may elicit a stronger response from adult raptors at nests than a gradual approach (White and Sherrod 1973).

The construction area (i.e., work areas, access routes, staging, and stockpile areas) is mostly located within a small portion of the former Van Arsdale Reservoir that does not represent foraging or nesting habitat for the majority of raptor species. At the time of construction, the reservoir would be dewatered and the Eel River would be re-routed around the construction site to allow for removal of Cape Horn Dam. Therefore, osprey and American peregrine falcon would also not likely be foraging in the construction area. Refer to the Surrender Application for analysis of dewatering the construction site.

The remainder of the construction area consists of a small riparian area, west of Van Arsdale Reservoir, where fill material would be placed to allow for construction of the new pump station. Construction activities (placement of fill) would require removal of 0.09 acre of riparian vegetation that potentially represents nesting or foraging habitat for short-eared owl, long-eared owl, osprey, and other common raptors. To avoid potential effects to nesting raptors in this area, ERPA would ensure the removal of riparian areas occurs outside the general avian nesting season (between September 1–December 31).

NERF construction noise and activities could also affect nesting and foraging raptors that may be present in the forested and cliff habitats in the Analysis Area but outside of the construction area. Although no known nests have been identified in the Analysis Area, northern (American) goshawk, golden eagle, osprey, American peregrine falcon, and other raptors could nest and forage in these areas.

To reduce the potential for effects to active northern (American) goshawk, golden eagle, and other raptor nests, ERPA would implement the Other Raptors Measure, which requires a pre-construction raptor survey to be conducted within 500 ft. of all construction work areas in the year prior to initiation of construction. Following completion of surveys, ERPA would conduct a GIS analysis of (1) location of active nests, (2) timing and location of construction activities (including helicopter flight paths and heavy equipment use), and (3) whether nests fall within the species-specific protective buffers established in PG&E's Avian Protection Plan and/or agency regulations and policies. Based on this analysis, the following avoidance and protection measures would apply:

- If nests are found within the no-disturbance buffer, ERPA would modify the timing of construction activities and/or helicopter flight paths, to the extent possible. If the timing or location of activities cannot be modified, ERPA would consult with resource agencies to establish a site-specific buffer to protect the nest considering site topography, natural barriers, and the nature of the construction activity.

American peregrine falcons typically nest on cliffs or human structures that mimic cliff habitat. There is no cliff-nesting habitat within 500-feet of the New Pump Station Construction Area, but suitable foraging habitat is present. Foraging American peregrine falcons could be disturbed by noise generated from the use of heavy equipment or human presence. However, construction is short-term and temporary; therefore, any effects to peregrine falcon foraging would be considered negligible.

Osprey typically nest on large trees but can also nest on human structures (i.e., power poles and transmission towers) that mimic tree habitat. The nearest known osprey nest is located approximately 1.5 mi. upstream of the construction area along the Eel River. Although there are no osprey nests within the Analysis Area, there is some potential that osprey nests could be established near the construction area.

In the unlikely event a new Other Raptor nest is established within 300 ft. of the construction area during the construction period, ERPA would develop site-specific no-disturbance buffers to be maintained until a qualified biologist has determined the nest is no longer active. Compared to other species, osprey are more tolerant of human disturbances and can place their nests in areas with human activity or heavy traffic (Harmata et al. 2007). Because of this tolerance behavior, if an osprey nest is located within 300 ft. of the construction area, a qualified biologist with stop-work authority would be onsite when NERF construction commences to monitor the behavior of osprey and to determine the level of monitoring that would be needed during the construction period. With implementation of the Osprey Measure, construction effects would be negligible.

Foraging raptors could also be flushed or disturbed by the noise of construction. Any effects from noise would be short-term and temporary and would cease after construction. Therefore, effects to foraging raptors would be temporary and negligible.

Therefore, with implementation of NERF construction measures, effects on raptors from construction activities would be reduced. However, as described above, construction must occur during the summer/fall prior to high flows to take advantage of dewatering activities that would be completed for removal of Cape Horn Dam and to allow the flushing of sediments to occur during high flows and address and reduce potential effects to aquatic resources in the Eel River downstream of Cape Horn Dam (refer to Surrender Application). If an active raptor nest is found, it may be determined that a site-specific buffer cannot be established to protect nests during construction. In the unlikely event that a raptor nest is present in the survey area, nest disturbance, failure, and/or potential abandonment may occur during construction and would be considered a significant unavoidable adverse effect.

To further protect other raptors, ERPA would also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Construction Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to ERPA as soon as practicable. Refer to Section 2.2.3, Table 2-15, for the full language of these construction measures.

Indirect Effects

Construction activities may also result in indirect effects to raptor nesting and foraging habitat. Placement of fill material west of the former Van Arsdale Reservoir to allow for construction of the new pump station would require removal of 0.09 acre of riparian vegetation. Removal of 0.09 acre would result in a minor reduction in roosting, foraging, or nesting habitat. Removal of trees immediately adjacent to existing roads and developed facilities would not significantly alter nesting habitat for raptors. Furthermore, as specified in the Riparian and Wetland Protection Measures, ERPA would obtain all necessary permits for removal of the riparian habitat and implement permit conditions (including any required riparian mitigation) as part of the Proposed Action. The remaining construction areas (i.e., work areas, access routes, staging, and stockpile areas) are primarily located within a portion of the historical inundation zone of Van Arsdale Reservoir and do not provide nesting habitat for raptors. Therefore, with implementation of construction measures, effects to nesting habitat would be considered negligible.

NERF construction activities may potentially affect foraging habitat for osprey. Use of ground-disturbing heavy equipment during implementation of NERF construction activities could result in temporary degradation of water quality in the Eel River immediately downstream following PG&E's removal of cofferdams completed as part of the Surrender Application (Section 2.2) through the potential release of hazardous materials including fuels or other chemicals. Such effects to water quality could degrade aquatic habitats. Degradation of water quality could, in turn, affect fish that represent prey species for foraging osprey. The potential for construction-related degradation of water quality would be addressed and reduced through implementation of the water quality construction measures (as described in Section 3.5.1.3 – Water Quality), and applicable BMPs. In addition, ERPA would implement the Riparian and Wetland Protection Measures, which requires ERPA to implement BMPs for work within and near aquatic habitats. Such BMPs may include prohibiting refueling of equipment within 100 ft. of wetlands, streams, or waterways; using secondary containment; providing spill kits onsite; and using appropriate erosion control materials. ERPA would also obtain coverage under Clean Water Act Section 404/401 permits and comply with all conditions of the permits. With implementation of these measures, potential effects to aquatic foraging habitats from degradation of water quality would be negligible.

Potential Effects to Other Special-status Birds, Common Birds or Game Birds

In addition to raptors, the Project vicinity contains suitable habitat for a variety of special-status birds and other common bird species, including game birds. Refer to Section 3.3.5, Table 3.3.5-3, for a list of special-status birds and Table 3.3.5-6 for a list of game birds that are known or may potentially occur in the Cape Horn Dam Area, including the New Pump Station Construction Area.

The Analysis Area for other special-status birds or game birds is defined as a 300-ft. buffer from the New Pump Station Construction Area and the developed Potter Valley Powerhouse Complex (i.e., Potter Valley Powerhouse Construction Area) (Section 2.2, Map 2-11a and Map 2-11b).

Provided below is a discussion of potential direct and indirect effects to other special-status birds or game birds and their habitat.

New Pump Station Construction Area

The New Pump Station Construction Area contains suitable habitat for tricolored blackbird (*Agelaius tricolor*) (BCC, ST, SSC), olive-sided flycatcher (*Contopus cooperi*) (BCC, SSC), loggerhead shrike (*Lanius ludovicianus*) (SSC), purple martin (*Progne subis*) (SSC), and yellow warbler (*Setophaga petechia*) (SSC).

Provided below is a discussion of potential direct and indirect effects to other special-status birds or game birds that are known to or may potentially occur in the New Pump Station Construction Area.

Direct Effects

Construction of the new pump station and associated facilities has the potential to directly disturb nesting special-status birds and game birds and potentially remove nests present in the 0.09 acre of riparian vegetation that would be removed. To address and reduce the potential for active nests to be removed during construction, ERPA would implement the Other Special-status Birds and Game Birds Construction Measures, which require vegetation removal outside the general nesting season (September 1–December 31).

Although no nests have historically been identified, special-status birds and other game could potentially nest in the Analysis Area, outside the construction area. To prevent potential effects to nesting birds, ERPA would implement the Other Special-status Birds and Game Birds Measures that require a pre-construction nesting bird survey to be conducted within a 300-ft. buffer of the construction area. If an active nest is found, avoidance buffers would be implemented, considering site-specific conditions such as level of disturbance proposed, ambient noise levels, and species-specific life history, until a qualified biologist determines that the young have fledged and are no longer dependent on the nest.

Foraging birds and game birds could also be flushed or disturbed by the noise of construction. Any effects from noise would be short-term and temporary and would cease after construction. Therefore, effects to foraging birds would be considered negligible.

To further protect other special-status birds and game birds, ERPA would also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Construction Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to ERPA as soon as practicable. Refer to Section 2.2.3, Table 2-15, for the full language of these NERF construction measures. With implementation of these construction measures, any direct effects to other special-status birds and game birds from nest removal or noise disturbance would be negligible.

Indirect Effects

As described above, NERF construction activities would result in removal of potential riparian nesting habitat for other special-status birds and game birds. Removal of 0.09 acre of riparian vegetation would result in a localized reduction in riparian nesting habitat for special-status birds and game birds. However, as specified in the Riparian and Wetland Protection Measures, ERPA would obtain all necessary permits for removal of the riparian habitat and implement permit conditions (including any required riparian mitigation) as part of the Proposed Action. To address and reduce effects to riparian habitat for other special-status birds and game birds, ERPA would implement the Riparian and Wetland Protection Measures that requires flagging of riparian vegetation within and directly adjacent to the construction area that would be avoided, obtaining appropriate permits and implementing permit conditions for the removal of riparian vegetation, and implementing BMPs for the protection of adjacent aquatic habitat.

As described above under bald eagle, use of ground-disturbing construction equipment during NERF construction activities could result in the degradation of water quality in aquatic habitats immediately downstream of the construction area in the Eel River (following removal of cofferdams completed as part of the Surrender Application; Section 2.2). Degradation of water quality could, in turn, affect aquatic macroinvertebrates that represent prey species for aquatic foraging birds such as swallows and martins. As described in detail above under the bald eagle section, the potential for effects to aquatic foraging habitats would be addressed and reduced with implementation of water quality construction measures (as described in Section 3.5.1.3 – Water Quality), applicable BMPs, and the Riparian and Wetland Protection Measures.

With implementation of these measures, proposed construction activities in the New Pump Station Construction Area would have negligible indirect effects on nesting and aquatic foraging habitat for other special-status birds and game birds.

Potter Valley Powerhouse Construction Area

As described above, NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation on a fully developed site (Section 2.2, Map 2-11b). Because there is limited to no vegetative cover, routine operation and maintenance activities are ongoing at the powerhouse, and only limited/minor construction would occur within the perimeter fence of the fully developed site, there would be no direct or indirect effects to special-status birds or other game. There may, however, be some common bird species such as house finch (*Haemorhous mexicanus*) and black phoebe (*Sayornis nigricans*) that could potentially nest on buildings and other structures within the construction area.

To avoid potential effects to nesting common birds, ERPA would implement the Other Special-status Birds and Game Birds Measures for active nest protection at the Potter Valley Powerhouse Construction Area. This includes conducting a pre-construction nesting bird survey in the Potter Valley Powerhouse Construction Area that would be affected by construction, including the Potter Valley Powerhouse. Surveys would be conducted during the nesting season (March 1 – August 31). If an active nest is found, avoidance buffers would be implemented, considering site-specific conditions such as level of potential disturbance, ambient noise levels, existing acclimation to disturbance, nest concealment barriers, and species-specific natural history. With implementation of measures, potential impacts to common nesting songbirds would be negligible.

Limited to no foraging habitat is available for songbirds within the construction area. Common nesting songbirds that may forage in the construction area would be acclimated to disturbance from ongoing operation and maintenance activities. Because construction is short-term and limited to work on existing facilities on a developed site, potential effects to foraging songbirds would be negligible.

Potential Effects on Special-status Bat Species

The Project vicinity contains suitable habitat for a variety of special-status bat species. A comprehensive roost survey was conducted at the New Pump Station Construction Area and Potter Valley Powerhouse Construction Area in 2018 (PG&E 2019). Refer to Section 3.3.5, Table 3.3.5-5 for a comprehensive list of Project facilities that were evaluated as providing suitable roosting habitat and were observed to contain bat roosts.

The analysis area for special-status bats is defined as the construction areas (Section 2.2, Map 2-11a and Map 2-11b). The Analysis Area also includes aquatic foraging habitats in the Eel River downstream of the former Cape Horn Dam site.

Provided below is a discussion of potential direct and indirect effects to special-status bats and their habitat.

<u>New Pump Station Construction Area</u>

Special-status bats are known to occur in the New Pump Station Construction Area as identified through acoustic analysis conducted in 2018. This includes pallid bat (*Antrozous pallidus*) (FSS, SSC), Townsend's big-eared bat (*Corynorhinus townsendii*) (FSS, SSC), and western red bat (*Lasiurus blossevillii*) (SSC) (PG&E 2019). In addition, suitable habitat for fringed myotis (*Myotis thysanodes*) is also present. A roost study was also conducted at facilities present within the construction area (PG&E 2019), and roosts of the common bat species Yuma myotis (*Myotis yumanensis*) were discovered. This includes a day roost in the Tunnel No. 1 Gage Shaft (Control Building), a maternity roost in the Van Arsdale Fish Screen Facility Motor Control Building, a night roost in the Van Arsdale Fish Screen Facility Storage Building, and a day roost in the Fish Attraction Facility (Fish Hotel) (A. Anderson, pers. comm. 2024).

Provided below is a discussion of potential direct and indirect effects to special-status bats that are known to or may potentially occur in the New Pump Station Construction Area.

Direct Effects

Special-status bat roosts could potentially be disturbed by NERF construction activities. One night roost located at the Fish Attraction Facility (Fish Hotel) would be excluded by PG&E prior to removal/lowering of the facility as part of the Surrender Application and would not be present at the time of construction of the new pump station. NERF construction activities at the Potter Valley

Powerhouse, including installation of the energy dissipation valve and associated instrumentation, would be implemented within 25 to 50 ft. of the remaining three roosts, consisting of one night roost, one day roost, and a maternity roost. Noise from NERF construction activities and increased human activity could result in disturbance to individual bats present in the day roosts and the maternal colony. However, because these roosts are located within existing facilities that are routinely maintained and operated by PG&E, construction would not take place at these facilities, and because construction activities are minor and short-term, impacts would be considered negligible.

Bats use night roosts as temporary resting locations when they are actively foraging at night. Construction would take place during the day; therefore, individual night roosts would not be directly disturbed during construction activities. Also, construction would not disturb foraging bats, which are nocturnal.

To protect special-status bats, ERPA would also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Construction Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to ERPA as soon as practicable. Refer to Section 2.2.3, Table 2-15, for the full language of NERF construction measures. With implementation of these measures, effects to bat roosts and foraging bats would be negligible.

Indirect Effects

NERF construction areas are primarily restricted to the former inundation zone of Van Arsdale Reservoir and would have no effect on roosting or foraging bats. However, placement of fill material west of the former Van Arsdale Reservoir to meet the grade of the concrete retaining wall and allow for construction of the new pump station would result in removal of 0.09 acre of riparian vegetation. Bats typically select the largest available trees or snags for roosts and require structures such as cavities or sloughing bark. If such roosting trees are present in the removal area, permanent removal of 0.09 acre of vegetation may result in a minor reduction in potential roosting and foraging habitat for special-status bats. Minimal removal of individual trees with cavities or sloughing bark could reduce the availability of roosting habitat for special-status bats, although this localized area is relatively small compared to the availability of potential nesting trees in surrounding forested habitats. Furthermore, as specified in the Riparian and Wetland Protection Measures, ERPA would obtain all necessary permits for removal of the riparian habitat and implement permit conditions, including any required riparian mitigation as part of the Proposed Action. With implementation of NERF construction measures, potential indirect effects to bat roosting habitat would be negligible.

Use of ground-disturbing heavy equipment during implementation of NERF construction activities could result in temporary degradation of water quality in the Eel River immediately downstream following PG&E's removal of cofferdams completed as part of the Surrender Application (Section 2.2) through the potential release of hazardous materials including fuels or other chemicals. Such effects to water quality could degrade aquatic habitats. Degradation of water quality in the Eel River could, in turn, affect aquatic macroinvertebrates that represent prey species for aquatic-foraging special-status bats. As described in detail above under the bald eagle section, the potential for effects to aquatic foraging habitat would be addressed and reduced through implementation of water quality construction measures (as described in Section 3.5.1.3 – Water Quality), applicable BMPs, and the Riparian and Wetland Protection Measures. Refer to Section 2.2.3, Table 2-15, for the full language of these construction measures. With implementation of NERF construction measures, potential indirect effects to aquatic foraging habitat would be negligible.

With implementation of these measures, proposed construction activities in the New Pump Station Construction Area would have negligible effects on roosting and aquatic foraging habitat for special-status bats.

Potter Valley Powerhouse Construction Area

Special-status bats are known to occur in the Potter Valley Powerhouse Construction Area as identified through acoustic analysis conducted in 2018. This includes pallid bat and Townsend's big-eared bat (PG&E 2019). In addition, suitable habitat for fringed myotis is also present. A roost study was also conducted at facilities present within the construction area (PG&E 2019), and roosts of the common bat species Yuma myotis were discovered. This includes a night roost in the Potter Valley Powerhouse Building and a day roost in the Potter Valley Powerhouse Cabana Outbuilding, located approximately 100 ft. southwest of the office building.

Provided below is a discussion of potential direct and indirect effects to special-status bats that are known to or may potentially occur in the Potter Valley Powerhouse Construction Area.

Direct Effects

The Potter Valley Powerhouse Construction Area is a developed site that consists of the Potter Valley Powerhouse and supporting structures. As described above, two facilities were identified as supporting bat roosts (day/night) during surveys. Several other adjacent facilities represent potential roosting habitat for bats (PG&E 2019). NERF construction activities would be implemented within 100 to 300 ft. of known active roosts. Noise from construction activities and increased human activity could result in disturbance to individual bats present in the day roost in the cabana building. However, because this roost is approximately 300 ft. from the active construction area, in an existing facility that is routinely maintained and operated by PG&E, and construction would be short-term, any effects to the day roost would be considered negligible.

Bats use night roosts as temporary resting locations when they are actively foraging at night. Construction would take place during the day; therefore, individuals in the night roost on the Potter Valley Powerhouse Building would not be directly disturbed during construction activities. Construction would also not affect foraging bats, which are nocturnal.

Indirect Effects

Because NERF construction activities would be limited to installation of the energy dissipation valve and associated instrumentation and would not require removal of any Project facilities or vegetation, there are no indirect effects to special-status bats or their roosting and foraging habitat.

Potential Effects to Mesocarnivores

The Project vicinity contains suitable habitat for two special-status mesocarnivores: the West Coast Distinct Population Segment of fisher (*Pekania pennanti*) (FSS, SSC) and the Pacific marten (also known as Humboldt marten) (*Martes caurina*) (FSS, ST).

The Analysis Area for special-status mesocarnivores is defined as a 0.5-mi. buffer from the New Pump Station Construction Area (Section 2.2, Map 2-11a). This buffer encompasses the construction work areas plus a disturbance buffer to account for any disturbance effects to mesocarnivores present in adjacent forested habitat.

As described above, NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2-11b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, there would be no direct or indirect effects to mesocarnivores from construction at the Potter Valley Powerhouse Construction Area.

Provided below is a discussion of potential direct and indirect effects to special-status mesocarnivores and their habitat in the New Pump Station Construction Area.

<u>New Pump Station Construction Area</u>

Suitable habitat for both fisher and Pacific marten is present in suitable forested habitats in the vicinity of the New Pump Station Construction Area (PG&E 2019). Provided below is a discussion of potential direct and indirect effects to special-status mesocarnivores that are known to or may potentially occur in the construction area.

Direct Effects

Potential direct effects to special-status mesocarnivores include disturbance from NERF construction activities (including helicopter use and vegetation removal) and the potential for vehicle collisions on construction routes.

As described above, the majority of construction work areas, access routes, staging, and stockpile areas are located within the former Van Arsdale Reservoir that does not provide foraging or denning habitat for mesocarnivores. Placement of fill material west of the former Van Arsdale Reservoir to meet the grade of the concrete retaining wall and allow for construction of the new pump station would, however, result in removal of 0.09 acre of riparian vegetation that represents potential dispersal habitat for special-status mesocarnivores. Due to the proximity of the habitat to existing Project facilities where maintenance and operations activities have routinely been implemented, mesocarnivores are unlikely to den in this area. However, there is the potential for a den to be present in suitable foraging habitat in the Analysis Area, outside of the construction area.

The Proposed Action may require helicopter use during the construction period. There is some potential for fisher or marten dens to be present in the Analysis Area, and based on existing literature, loud noises from construction have the potential to alter behavior and adversely affect breeding/denning. This effect would be temporary and limited to the period of construction; however, some potential remains for the Proposed Action to result in adverse effects to breeding mesocarnivores. Fisher denning occurs between October and June, and martin denning for breeding occurs between February and June.

Vehicle strikes are also known to be a significant source of mortality for mesocarnivores in some areas (USFS 2020). To reduce the potential for vehicle strikes, ERPA would implement the Mesocarnivores Construction Measures, which restricts contractor speed limits within the construction areas. To further protect special-status mesocarnivores, ERPA would also implement General Construction Measures, which require all contractors and staff to be given instructions on how to comply with site-specific avoidance and protection measures, and General Wildlife Construction Measures, which require work to stop if special-status species that were previously undiscovered are observed and the observations to be reported to ERPA as soon as practicable. Refer to Section 2.2.3, Table 2-15, for the full language of these construction measures. With implementation of these measures, potential effects to mesocarnivores from vehicle strikes would be negligible.

With implementation of NERF construction measures, direct effects to special-status mesocarnivores from vegetation removal and vehicle strikes would be negligible. There remains, however, some potential for adverse effects to denning mesocarnivores resulting from noise disturbance (e.g., helicopters).

Indirect Effects

The proposed construction activities at the New Pump Station Construction Area would result in minimal effects to denning habitat for special-status mesocarnivores for several reasons. NERF construction areas (work areas, access routes, staging, and stockpile areas) would be mostly located within the former Van Arsdale Reservoir that does not represent denning or foraging habitat for special-status mesocarnivores. While, as described above, some vegetation removal is required for construction of the new pump station, the vegetation is located adjacent to a public road and existing facilities where operations and maintenance activities are implemented under current conditions, and therefore, this vegetation is unlikely to support denning special-status mesocarnivores. Therefore, effects to denning habitat would be negligible.

NERF construction activities would result in removal of approximately 0.09 acre of riparian vegetation that represents potential dispersal habitat for special-status mesocarnivores. However, because this vegetation is located adjacent to existing facilities where maintenance and operations are implemented and between the former Van Arsdale Reservoir and Van Arsdale Road, mesocarnivores would likely avoid these areas. In addition, as specified in the Riparian and Wetland Protection Measure, ERPA would obtain all necessary permits for removal of the riparian habitat and implement permit conditions (including any required riparian mitigation) as part of the Proposed Action. Therefore, effects to special-status mesocarnivore riparian dispersal habitat would be considered negligible.

Potential Effects to Tule Elk or Other Game Mammals

Tule elk are known to occur on the north shore of Lake Pillsbury and also in the community of Potter Valley along the East Branch Russian River. In addition to tule elk, suitable habitat for a variety of other game mammal species such as black-tailed deer (*Odocoileus hemionus columbianus*) and black bear (*Ursus americanus*) is also present.

The Analysis Area for tule elk and other game mammals is defined as a 0.5-mi. buffer from the New Pump Station Construction Area (Section 2.2, Map 2-11a). This buffer was determined based on a study that measured avoidance distances from motorized and un-motorized recreation activities on public forests (Wisdom et al. 2018).

As described above, NERF construction activities within the Potter Valley Powerhouse Construction Area are limited to installation of an energy dissipation valve and associated instrumentation in a fully developed site (Section 2.2, Map 2-11b). Because routine operation and maintenance activities are ongoing at the powerhouse and only limited/minor construction would occur within the perimeter fence of the fully developed site, there would be no direct or indirect effects to tule elk or other game mammals from construction at the Potter Valley Powerhouse Construction Area.

Provided below is a discussion of potential direct and indirect effects to tule elk and other game mammals and their habitat.

<u>New Pump Station Construction Area</u>

Tule elk are not known to occur in the immediate vicinity of the New Pump Station Construction Area. Forests and riparian areas surrounding the former Van Arsdale Reservoir and the Eel River downstream of the former Cape Horn Dam also provide suitable habitat for a wide variety of other game mammals.

Provided below is a discussion of potential direct and indirect effects to game mammals that are known to or may potentially occur in the New Pump Station Construction Area.

Direct Effects

Noise from construction equipment, human presence, and helicopter use necessary to build the new pump station and ancillary facilities could result in disturbance effects to game mammals. Game mammals may be temporarily flushed or change their foraging patterns in response to elevated noise levels in the construction areas. These effects are expected to be temporary (i.e., restricted to the construction period), and therefore, direct effects to tule elk and other game mammals from NERF construction activities would be negligible.

Indirect Effects

Placement of fill material west of the former Van Arsdale Reservoir to meet the grade of the concrete retaining wall and allow for construction of the new pump station would result in removal of 0.09 acre of riparian vegetation. While removal of this vegetation could reduce the availability of riparian foraging habitat for game mammals, this localized area is relatively small compared to the availability of riparian foraging habitat in the Analysis Area. In addition, as specified in the Riparian and Wetland Protection Measure, ERPA would obtain all necessary permits for removal of the riparian habitat and implement permit conditions (including any required riparian mitigation) as part of the Proposed Action. Therefore, effects to riparian foraging habitat for game mammals would be considered negligible.

Construction and Environmental Measures

To avoid or reduce effects to wildlife resources during construction, ERPA would obtain, prepare, and/or implement the following measures. A complete list of construction measures is included in Section 2.2.3.

- General Construction Measures
- Invasive Weed Construction Measures
- Riparian and Wetland Protection Measures
- General Wildlife Construction Measures
- Bald Eagle Conservation Plan
- Other Raptor Construction Measures (including Osprey, American Peregrine Falcon, and Other Raptor Measures)
- Other Special-status Birds and Game Birds Construction Measures
- Mesocarnivores Construction Measures

Unavoidable Adverse Effects

The following unavoidable adverse effects to resources are described below and organized by species:

- Bald Eagle
  - Potential nest abandonment at the New Pump Station Construction Area from noise of NERF construction activities.
- Other Raptors
  - Potential nest abandonment at the New Pump Station Construction Area from noise of NERF construction activities.
- Special-status Mesocarnivores
  - Potential disturbance to dens from NERF construction activities

References

Anderson, A. 2024. E-mail communications from Andrew Anderson, PG&E biologist, to Robyn Smith of JNA-Consulting providing information on bat roosts at Project facilities. October 16, 2024.

Anderson, B.A. 2007. A Literature Review of the Effects of Helicopter Disturbance and Noise on Selected Wildlife Species.

Calflora. 2024. Information on California plants for education, research and conservation. [web application]. Berkeley, California: The Calflora Database [a non-profit organization]. Available: http://www.calflora.org/.

CNDDB (California Natural Diversity Database). 2024. RareFind5 (Internet), Version 5.3.0. California Department of Fish and Wildlife.

Forsman, E.D., R.G. Anthony, E.C. Meslow, and C.J. Zabel. 2004. Diets and foraging behavior of northern spotted owls in Oregon. Journal of Raptor Research 38(3): 214–230.

Harmata, P.J., M. Restani, and A.R. Harmata. 2007. Settlement patterns, foraging behavior, and reproductive success of ospreys along a heterogeneous riverine corridor. Canadian Journal of Zoology 85: 56–62.

Jackman, R.E., and J.M. Jenkins. 2004. Protocol for Evaluating Bald Eagle Habitat and Populations in California. June 2004.

PG&E (Pacific Gas and Electric Company). 2019. TERR 2 – Wildlife Resources Study Data Memorialization, Technical Study Summary. Potter Valley Project (FERC Project No. 77 Relicensing).

PG&E (Pacific Gas and Electric Company). 2021. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2021.

PG&E (Pacific Gas and Electric Company). 2022. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2022.

PG&E (Pacific Gas and Electric Company). 2023. California Bald Eagle Nesting Territory Survey Forms for the Potter Valley Hydroelectric Project, 2023.

USFS (U.S. Forest Service). 2020. Programmatic Biological Assessment for the Southern Sierra Nevada Distinct Population Segment of Pacific Fisher. USFS, Pacific Southwest Region. May 19, 2020.

USFWS (U.S. Fish and Wildlife Service). 2007. National Bald Eagle Management Guidelines.

USFWS (U.S. Fish and Wildlife Service). 2012. Endangered and threatened wildlife and plants; designation of revised critical habitat for the northern spotted owl. Final rule. 50 CFR Part 17 (FWS-R1-ES-2011-0012). Available at: http://www.regulations.gov.

White, C.M., and S.K. Sherrod. 1973. Advantages and Disadvantages of the Use of Rotor-Winged Aircraft in Raptor Surveys. Journal of Raptor Research 7(3/4): 97–104.

Wisdom, M.J., H.K. Preisler, L.M. Naylor, R.G. Anthony, B.K. Johnson, and M.M. Rowland. 2018. Elk responses to trail-based recreation on public forests. Forest Ecology and Management 411: 223–233.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

BMP	best management practices
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
Project	Potter Valley Hydroelectric Project
SPCC	Spill Prevention, Control, and Countermeasures

This Page Intentionally Left Blank

3.5.1.7 Geology and Soils

This section describes the potential effects to geology and soils that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in geology and soils that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effects to geology and soils resulting from construction of the New Eel-Russian Facility (NERF) were analyzed:

- Potential for soil erosion during construction activities; and
- Potential for soil contamination from the accidental spill of oil, fuel, or other toxic materials.

For the purposes of this section, the Analysis Area is the NERF construction and staging areas shown on Maps 2-11a and 2-11b (Section 2.2) and the associated temporary access roads.

Construction-related Soil Erosion

Under the Proposed Action, temporary access roads and staging areas would be constructed and the dewatered construction area[1] would be excavated, filled, and graded to facilitate construction of the NERF. Construction of the temporary access roads and staging areas, and earthmoving activities (e.g., excavation and grading), would involve the use of heavy equipment and ground-disturbing activities that have a high likelihood of causing erosion, especially along any unpaved temporary access routes and in areas dominated by unconsolidated Quaternary sediments.

Erosion from the construction areas and the resulting runoff could temporarily impact water quality in the Eel River downstream of the NERF construction area by increasing sedimentation and turbidity, both of which are considered adverse impacts. Accordingly, ERPA would implement an Erosion Prevention Plan and best management practices (BMPs) to minimize and control soil erosion to protect water quality during construction. In addition, ERPA would obtain applicable

[1] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

resource agency and construction permits. With these measures, the potential for excessive soil erosion, sedimentation, and related water quality impacts are considered negligible.

Potential for Soil Contamination from an Accidental Spill of Fuel or Other Toxic Materials

Construction of the NERF would involve the use of heavy equipment, machinery, and vehicles. Soil contamination has the potential to occur from accidental spills of fuels or other materials used in heavy equipment operations during construction activities. The potential for soil contamination is considered an adverse impact. Accordingly, ERPA would implement Hazardous Materials Measures to avoid or minimize the risk of soil contamination from accidental spills. These measures would include the following: implementing construction-related BMPs to control spills; having emergency cleanup equipment readily available onsite; and implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan, with protocols for preventing spills and managing incidents should they occur. In addition, ERPA would obtain applicable resource agency and construction permits. Potential effects from soil contamination from construction would be reduced to a negligible level with adherence to the SPCC Plan and construction-related BMPs.

Environmental Measures

To avoid or reduce potential soil erosion and sedimentation during construction, ERPA would obtain, prepare, and/or implement the following measures and plans. These measures and plans would be applied during implementation during the Proposed Action, as appropriate. A complete list of construction measures is included in Section 2.2.3.

- Standard BMPs that are designed to protect water quality by minimizing and controlling erosion and sedimentation;
- An Erosion Prevention Plan; and
- Hazardous Materials Measures
  - A SPCC Plan
  - Construction-related BMPs
  - Required compliance with applicable local, state, and federal standards associated with handling and disposal of hazardous materials

Unavoidable Adverse Effects

No unavoidable adverse effects to soils are expected from construction of the NERF.

TABLE OF CONTENTS

List of Acronyms

BMP	best management practices
CDFW	California Department of Fish and Wildlife
CWA	Clean Water Act
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ERPA	Eel-Russian Project Authority
ESA	Endangered Species Act
ESU	evolutionary significant unit
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NMFS	National Marine Fisheries Service
NPUPL	Non-Project Use of Project Lands
PMF	probable maximum flood
Project	Potter Valley Hydroelectric Project
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers

This Page Intentionally Left Blank

3.5.1.8 Geomorphology

This section describes the potential effects to geomorphology that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in geomorphology that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effects to channel geomorphology resulting from construction of the New Eel-Russian Facility (NERF) were analyzed:

- Erosion and sedimentation to the channel resulting from construction activities; and
- Modification of the Eel River channel resulting from construction of the NERF.

For the purposes of this section, the Analysis Area is the NERF construction and staging areas near Cape Horn Dam, as shown in Section 2.2 (Map 2-11a) and associated temporary access roads. The proposed construction activities near Potter Valley Powerhouse are not hydrologically connected to the East Branch Russian River and are therefore not evaluated below.

Erosion and Sedimentation to the Channel Resulting from NERF Construction Activities

The NERF construction area encompasses a portion of the historic inundation zone of Van Arsdale Reservoir (between the former Cape Horn Dam and the Van Arsdale Fish Screen Facility). Under the Proposed Action, temporary access roads and staging areas would be constructed and the dewatered construction area[1] would be excavated and graded to facilitate construction of the NERF. Construction of NERF temporary access roads and staging areas, and earthmoving activities (e.g., excavation and grading), would involve the use of heavy equipment and ground-disturbing activities. These activities could result in exposing and creating unstable slopes, toppling of unstable material, compacting soils, and removing vegetative cover that would expose soil to rainfall and concentrated runoff. The excavation of sediment and placement of fill and exposure of erodible sediments during construction could cause erosion and potentially result in the delivery of sediment into the Eel River or flood prone areas. Accordingly, ERPA would implement an Erosion Prevention Plan, construction best management practices (BMPs), and a Stormwater Pollution Prevention Plan (SWPPP) to minimize and control soil erosion. In addition,

1 Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

ERPA would obtain applicable resource agency and construction permits. With these measures, the potential for excessive soil erosion and sedimentation to affect channel geomorphology is considered negligible.

Modification of the Eel River Channel Resulting from Construction of the NERF

Construction of the NERF would include removal / repositioning of riverine sediment to provide construction access, construction of the new pump station and ancillary facilities, construction of a concrete retaining wall, and placement of the conduit between the pump station and tunnel inlet and fill behind the concrete retaining wall. These activities would occur in the dry. The concrete retaining wall would be located along river left running parallel with flow between the pump station and the existing Van Arsdale Diversion facility (Section 2.2, Map 2-11a). The retaining wall would serve as a lateral constraint to the river channel to route water past the new pump station and through the control section and protect the facility and would be about 290-feet in length. Construction would result in permanent fill of approximately 0.86 acre of reservoir/riverine habitat. Stockpiled material from the dam removal[2] and other imported material (if necessary) would be used to backfill the retaining wall. This area would be converted from reservoir/river or floodplain habitat to upland habitat that would be protected by the retaining wall, which would "push" the river channel to the river right side (looking downstream). The construction area is critical habitat for federal Endangered Species Act (ESA) Northern California Coastal DPS steelhead (*Oncorhynchus mykiss*) and California Coastal evolutionary significant unit (ESU) Chinook salmon (*O. tshawytscha;* see Section 3.5.1.4). The Eel River at Cape Horn Dam is also a critical fish and aquatic species migration corridor for a number of special-status species (Section 3.5.1.4). The existing fish ladder and a portion of Cape Horn Dam will be removed as part of PG&E's decommissioning of Potter Valley Project (Project) facilities (Section 2.2.1, Surrender of License).

Modification of the Van Arsdale Reservoir/Eel River channel (less than 1 acre) may be an unavoidable component of construction of the NERF. ERPA will obtain and comply with the following:

- Clean Water Act (CWA) Section 401 permit
- U.S. Army Corps of Engineers (USACE) 404 permit for placement of fill material into "waters of the United States." The USACE may require compensatory mitigation for fill of "waters of the United States."
- Section 7(a)(2) of the ESA requires federal agencies (USACE) to consult with the National Marine Fisheries Service (NMFS) to ensure that actions they authorize or permit will not jeopardize the continued existence of listed species or adversely modify designated critical habitat or Essential Fish Habitat (EFH; steelhead and Chinook salmon).
  - USACE would consult with NMFS to determine if the fill, retaining wall, and pumps "may affect" critical habitat.

[2] The material would be tested to ensure it would be suitable for this purpose.

– Additional action may be required (e.g., Biological Assessment, Biological Opinion, compensatory mitigation).

– The NMFS' issuance of a Biological Opinion would authorize adverse modifications to critical habitat and EFH and would include reasonable and prudent measures to minimize the effects of the Proposed Action on critical habitat, including compensatory mitigation for unavoidable adverse effects, as necessary.

In addition, the NERF Engineering Design Report would include evaluations of the design (structural and mechanical), hydrology, hydraulics, and channel geomorphology to ensure the NERF would result in a geomorphologically stable channel and would withstand and pass the 100-year flood and not adversely affect the Eel River channel's ability to safely convey unimpaired flows without undue erosion to the channel banks and floodplain. In addition, the report would include an evaluation to ensure that fish passage will occur at the deconstructed Cape Horn Dam and NERF facility over a wide range of flows.

Construction of the NERF (concrete retaining wall and permanent fill of a portion of the Eel River) may have an unavoidable permanent adverse effect on the Eel River channel. The retaining wall and fill would modify the shape of about 290 feet of river channel and alter the existing location of the channel farther to the river right. The NERF Engineering Design Report and required permitting would ensure the design of a stable river channel and fish passage. During construction of the NERF, ERPA would comply with their CWA 404 and 401 and California Department of Fish and Wildlife (CDFW) 1600 permits and any compensatory mitigation required by the permitting agencies. However, the placement of fill within 0.86 acre of the channel in the Eel River within Van Arsdale River may be an adverse effect.

Environmental Measures

To avoid or reduce potential erosion and channel sedimentation and alteration of geomorphic form and process, ERPA will obtain, prepare, and/or implement the following measures and plans. These measures and plans will be applied during implementation during the Proposed Action, as appropriate. A complete list of construction measures is included in Section 2.2.3.

- Standard BMPs that are designed to control erosion and sedimentation
- Erosion Prevention Plan
- SWPPP
- NERF Engineering Design Report that ensures:
- Channel design for fish passage over a wide range of flows.
- A stable geomorphic structure and channel that would withstand and pass the 100-year flood and safely convey unimpaired flows without undue erosion to the channel banks and floodplain.

Unavoidable Adverse Effects

The Proposed Action may have an unavoidable adverse effect on about 290 feet of the Eel River channel in the NERF construction footprint. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

TABLE OF CONTENTS

List of Acronyms

ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
W&SR	Wild and Scenic River

This Page Intentionally Left Blank

3.5.1.9 Land Use

This section describes the potential effects to land use that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in land use that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effects to land use resulting from construction of the New Eel-Russian Facility (NERF) were analyzed:

- Potential changes to land use that could occur as a result of NPUPL;
- Potential fire risk during construction;
- Potential damage to roads as a result of construction activities; and
- Potential effects on Eel River Wild and Scenic River (W&SR) status that could result during and from construction of the NERF.

The Analysis Area is limited to the NERF construction footprint, which includes the work and staging areas in the immediate vicinity of Cape Horn Dam and a limited area in and around the Potter Valley Powerhouse, as shown on Maps 2-11a and 2-11b (Section 2.2). The entire NERF construction footprint will be within the existing FERC Potter Valley Hydroelectric Project (Project) Boundary.

Potential Effects on Land Use

All the NERF construction and staging areas would be located entirely within the existing FERC Project Boundary. All land within the FERC Project Boundary is under FERC jurisdiction, and all activities within the FERC Project Boundary are subject to the terms and conditions outlined in Pacific Gas and Electric Company's (PG&E's) license for the Project. Any NPUPL (i.e., construction of the NERF facilities) must be authorized by FERC to ensure that non-Project activities are consistent with the Project license and purpose.

Since the NERF would be located within the FERC Project Boundary, ERPA would be subject to the applicable terms and conditions contained in PG&E's FERC license, including applicable requirements related to the protection of environmental resources. The NERF facility would function mainly as a diversion structure, and construction of the facility would be compatible with existing land use. During construction of the NERF, the land use designation and jurisdiction would remain unchanged relative to existing conditions. Therefore, construction of the NERF would have no effect on jurisdiction or land use.

Potential Fire Risk during Construction

Construction sites are subject to fire risks from the use of combustible fuels and ignition sources from equipment. A fire that occurs during construction can result in injury to workers; structural damage; destruction of machinery, equipment, or materials; and delay in Project completion.

Article 27 of the existing FERC license requires the licensee to prevent, control, and suppress fires on Project lands. Since the NERF would be constructed within the FERC Project Boundary, ERPA would be subject to the same requirement. Therefore, to avoid or reduce the risk of fire during construction activities, ERPA would implement a Construction Fire Plan that includes specific measures to prevent, detect, and respond to a fire in the NERF construction area, and is consistent with the PG&E utility fire standard (EMER-4102S). In addition, similar to PG&E's requirements, all construction vehicles would be required to carry basic fire suppression equipment, including, for example, fire extinguishers and hand tools such as shovels and picks. Motorized equipment and vehicles would have spark arrestors, preventing unintended fire ignition due to sparks. Implementation of a Construction Fire Plan would minimize the possibility of a fire igniting or spreading in the construction area. Therefore, with a Construction Fire Plan in place, the risk of fire is considered a negligible impact.

Potential Damage to Roads as a Result of Construction Activities

Construction of the Eel River components of the NERF would require the use of heavy construction vehicles, including haulers and large trucks. Frequent trips by heavy construction vehicles can cause excessive wear along the main travel routes, requiring post-construction repairs. All roadways within the FERC Project Boundary would be restored to existing condition or better as part of NERF construction to facilitate continued safe access to the NERF. The use of roadways outside of the FERC Project Boundary would require transportation permits from Caltrans (e.g., oversized/overweight or variance permit) and potentially county permits. These permits would contain measures designed to minimize damage to existing roadways and would include restoration requirements where damages are incurred. Therefore, road damage resulting from construction vehicle use is considered negligible.

Potential Effects on W&SR Designation

The Eel River from 100 yards downstream of Cape Horn Dam to its mouth is designated as a WS&R under both the National and California W&SR systems. The W&SR Act specifically prohibits the construction of dams or diversions on W&SRs, mainly to preserve the free-flowing nature of the river. The NERF would be constructed upstream of the start of the W&SR segment and would replace an existing diversion that pre-dates the W&SR Act. In addition, the NERF design would allow for a free-flowing river through this reach. Therefore, construction of the NERF would have no effect on the Eel River W&SR designation.

Environmental Measures

Potential impacts to land use from construction of the NERF are considered negligible. However, the following measures will be implemented to minimize potential impacts to land use:

- Implement best management practices
  - Limit work areas to minimize disturbance; and
  - Limit location of staging and access to developed routes and previously disturbed areas to the extent practical.
- Implement a Construction Fire Plan to reduce the risk of fire
- Repair or restore roadways located within the FERC Project Boundary to pre-construction conditions or better
- Adhere to measures contained in county and/or Caltrans road use permits

Unavoidable Adverse Effects

Construction of the NERF would not result in unavoidable adverse impacts to land use.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

ERPA	Eel-Russian Project Authority
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
ORV	Outstandingly Remarkable Value

This Page Intentionally Left Blank

3.5.1.10 Recreation Resources

This section describes the potential effects to recreation resources that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in recreation resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effect to recreation resources resulting from construction of the New Eel-Russian Facility (NERF) was analyzed:

- Reduction in recreation opportunities and experiences during construction.

As discussed in Section 3.3.9, recreation opportunities in the Cape Horn Dam Area are limited due to private land ownership and access constraints. The only developed recreation facility in the vicinity of Cape Horn Dam is Trout Creek Campground, which is located on the north side of the Eel River, approximately 3.7 river miles upstream of Cape Horn Dam. This facility consists of 13 family campsites, one double-occupancy site, and one walk-in group site that can accommodate up to 18 people. Trout Creek Campground primarily supports stream-based recreation activities such as swimming, wading, and canoeing. Fishing is not allowed on the Eel River between Cape Horn Dam and Scott Dam (see Section 3.3.9).

Trout Creek Campground is located more than 3.5 miles upstream of the proposed NERF construction area. No construction activity will occur in the vicinity of Trout Creek Campground. In addition, the Eel River in the vicinity of Trout Creek campground will not be dewatered to facilitate construction. The same range of flows that recreation visitors currently experience will be present during construction of the NERF. Furthermore, construction of the NERF will not impede access to Trout Creek Campground. Recreation visitors will continue to be able to use Trout Creek Campground as they do now. Therefore, construction of the NERF facilities will have no effect on recreation use or opportunities on the Eel River compared to existing conditions.

Installation of an energy dissipation valve and associated instrumentation at the Potter Valley Powerhouse will occur at the powerhouse. Public access to the area around the Potter Valley Powerhouse and powerhouse discharge channel is prohibited and restricted by a locked gate. Therefore, no recreation use occurs in the immediate vicinity of the Potter Valley Powerhouse, or along the powerhouse discharge channel. In addition, there are no developed recreation facilities on the East Branch Russian River, near the powerhouse. Therefore, construction activities at the Potter Valley Powerhouse will have no effect on recreation use or opportunities.

Environmental Measures

Construction of the NERF facilities will have no effect on recreation use or opportunities.

Unavoidable Adverse Effects

There would be no unavoidable adverse effects on recreation resources as a result of implementing the Proposed Action.

TABLE OF CONTENTS

List of Acronyms

Caltrans	California Department of Transportation
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
ORV	Outstandingly Remarkable Value
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
W&SR	Wild and Scenic River

This Page Intentionally Left Blank

3.5.1.11 Aesthetic Resources

This section describes the potential effects to aesthetic resources that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in aesthetic resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effects to aesthetic resources resulting from construction of the New Eel-Russian Facility (NERF) were analyzed:

- Potential effects on aesthetic resources from construction of the NERF, including the dewatered channel and presence of construction work and staging areas at and around the construction work areas.
- Potential effects on Eel River Wild and Scenic River (W&SR) status that could result during and from construction of the NERF.
- Potential effects on scenic corridors that could result during and from construction of the NERF.

For the purposes of this section, the Analysis Area is defined as the NERF construction footprints shown on Map 2-11a and 2-11b (Section 2.2).

Effects of NERF Construction on Aesthetic Resources

Under the Proposed Action, construction of the NERF on the Eel River would primarily involve repositioning sediment to facilitate construction access, constructing a retaining wall, placing fill behind the retaining wall, and constructing a new pump station and ancillary facilities. All of these activities would occur within a relatively small footprint immediately upstream of the existing Cape Horn Dam, on Project lands within the existing FERC boundary. Renderings depicting the NERF facilities on the Eel River during construction and upon completion are provided in Section 2.0, Figures 2-8 through 2-11.

During construction of the NERF, the Eel River flows would be bypassed around and the work area would be dewatered,[1] exposing the stream channel and temporarily altering views that are currently characterized by a flowing river. Equipment staging and work areas for construction of the NERF would introduce heavy equipment, fencing, and other materials that would contrast with the surrounding landscape. Equipment and materials used for construction include metal, concrete, and high-visibility colors, which are expected to stand out against the colors, textures, lines, and forms of the natural environment. This contrast would draw the viewers' attention to the construction elements and temporarily reduce the scenic quality of the area. Although obstructed views of the construction sites may be visible to motorists travelling along Ridgeway Highway and Van Arsdale Road (refer to Map 3.3.17-2 in Section 3.3.17), the construction area is not visible from any primary travel corridor. In addition, all construction activities would occur in an area that also would be highly disturbed for the removal of Cape Horn Dam and the ancillary facilities. Since the NERF construction activities would be temporary and would occur in the area disturbed for the removal of Cape Horn Dam that is not readily visible to the general public, potential impacts to visual resources during construction of the NERF are considered negligible.

The NERF facilities on the Eel River would be constructed in an area where existing views are dominated by the presence of a concrete dam, fish ladder, and ancillary related structures. As shown in the renderings included in the description of the Proposed Action (Section 2.0, Figures 2-9 and 2-11), the scale of the NERF and colors and materials to be used have been designed to blend and conform to the surrounding natural environment. The design and material selection are consistent with Mendocino General Plan Policy RM-135. Upon completion, the NERF would be smaller in scale then the existing Cape Horn Dam facilities and would blend more harmoniously with the surrounding natural environment compared to existing conditions. Therefore, construction of the NERF would benefit visual resources compared to existing conditions.

Construction of the NERF would also involve installation of an energy dissipation valve and associated instrumentation at the Potter Valley Powerhouse. The installation of these features is comparatively minor and would occur within the powerhouse compound in an area that is not accessible to the public, and in an area that is not readily visible to the general public. In addition, installation of these features would not involve prolonged disturbance or the use of heavy equipment beyond what is typically used to operate and maintain a powerhouse. Accordingly, NERF-related construction activities at the Potter Valley Powerhouse would not affect visual resources compared to existing conditions.

Effects of the Proposed Action on W&SR Designation

The Eel River from 100 yards downstream of Cape Horn Dam to its mouth is designated as a WS&R under both the National and California W&SR systems. The segment of the Eel River from 100 yards downstream of Cape Horn Dam to the confluence of Tomki Creek is classified as a "Recreational" river segment (not Wild or Scenic). The NERF will be constructed upstream of

[1] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

the W&SR segment. The NERF would be constructed to allow for a free-flowing Eel River. In addition, since the Eel River in the vicinity of Cape Horn Dam is not classified as Scenic, any visible changes related to construction of the NERF will have no effect on the Eel River's W&SR designation.

Effects of the Proposed Action on Scenic Corridors

There are no designated scenic highway segments in the Cape Horn Dam Area (California Department of Transportation [Caltrans] 2024). Additionally, the Mendocino County General Plan does not identify any specific scenic corridors in Mendocino County (Mendocino County 2020). Therefore, NERF construction activities in the Cape Horn Dam Area would not result in impacts to aesthetic resources along any state-designated scenic highways or county-designated scenic corridors.

Environmental Measures

Implementation of the Proposed Action is not expected to result in adverse impacts to aesthetic resources compared to the No-Action Alternative; therefore, no environmental measures are proposed.

Unavoidable Adverse Effects

There would be no unavoidable adverse effects on aesthetics resources as a result of implementing the Proposed Action.

References

Caltrans (California Department of Transportation). 2024. California state scenic highway system map. Available at: https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa. Accessed May 2024.

Mendocino County. 2020. Mendocino county general plan, resource management element. Available at: https://www.mendocinocounty.gov/home/showpublisheddocument/54487/638055061981600000. Accessed June 2024.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

APE	Area of Potential Effects
CFR	Code of Federal Regulations
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NHPA	National Historic Preservation Act
NPUPL	Non-Project Use of Project Lands
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
SHPO	State Historic Preservation Office
Tribes	California Indian Tribes

This Page Intentionally Left Blank

3.5.1.12 Cultural Resources

This section discusses potential effects to cultural resources that could occur from Non-Project Use of Project Lands (NPUPL). Unavoidable adverse effects are discussed at the end of this section.

The Proposed Action for NPUPL is described in Section 2.2.2.

Potential Effects

The NPUPL qualifies as an "undertaking," as defined in Code of Federal Regulations (CFR) Part 800.16(y), with the potential to affect cultural resources that could qualify as historic properties (36 CFR Part 800.3[a]) and must comply with Section 106 of the National Historic Preservation Act (NHPA) to reduce effects to the properties. The criterion of adverse effect is defined in Section 106 of the NHPA implementing regulations at 36 CFR Part 800.5(a)(1). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Historic properties are defined as any district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. The term includes properties of traditional religious and cultural importance to California Indian Tribes (Tribes) that meet the criteria for inclusion in the NRHP.

Under the Proposed Action, construction of the New Eel-Russian Facility (NERF) on the Eel River would primarily involve repositioning sediment to facilitate construction access, constructing a retaining wall, placing a conduit from the pump station to the tunnel inlet and fill behind the retaining wall, and constructing a new pump station and ancillary facilities. All these activities would occur within the river immediately upstream of the existing Cape Horn Dam, on Project lands within the existing Federal Energy Regulatory Commission (FERC) Project Boundary. At the time of construction, the reservoir would be dewatered and the Eel River would be re-routed around the construction site to allow for removal of Cape Horn Dam.[1,2] Renderings depicting the NERF facilities on the Eel River during construction and upon completion are provided in Section 2.0, Figures 2-8 through 2-11. Based on review of available information listed in Section 3.3.11 (Cultural Resources Affected Environment) there are cultural resources that could qualify as historic properties in the NERF construction area.

---

[1] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

[2] An Area of Potential Effect (APE) has not been determined for the Proposed Action for NPUPL and will be developed in consultation with FERC, permitting agencies, State Historic Preservation Officer, Tribes, and stakeholders.

No resource-specific studies have been conducted to help identify the specific effects of Pacific Gas and Electric Company's (PG&E's) request to allow Eel-Russian Project Authority (ERPA) to construct the NERF on lands within the FERC Project Boundary. However, potential adverse effects from construction of these components of the NERF to cultural resources may include the following:

- Physical destruction of or damage to all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties (36 CFR Part 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features; and
- Transfer, lease, or sale of the historic property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

All NERF construction and staging areas would be located entirely within the existing FERC Project boundary. All land within the FERC Project Boundary is under FERC jurisdiction, and all activities within the FERC Project Boundary are subject to the terms and conditions outlined in PG&E's license for the Project. Any NPUPL activity (i.e., construction of the NERF facilities) must be authorized by FERC to ensure that non-Project activities are consistent with the Project license and purpose. Since the NERF would be located within the FERC Project Boundary, ERPA would be subject to the applicable terms and conditions contained in PG&E's FERC license, including applicable requirements related to the protection of environmental and cultural resources and compliance with the NHPA and the FERC license–specific cultural resource management plan. ERPA will also need to acquire separate permits for construction of the NERF from state and federal agencies such as a permit under Section 404 of the Clean Water Act, which requires compliance with the NHPA, for authorization from the U.S. Army Corps of Engineers for the discharge of dredged or fill material into all waters of the United States.

Environmental Measures

To comply with federal and state cultural resource laws and to avoid, reduce or mitigate potential adverse effects to cultural resources:

- Any NPUPL activity (i.e., construction of the NERF facilities) must be authorized by FERC to ensure that non-Project activities are consistent with the Project license and purpose, including review of the proposed construction plan under the FERC license–specific cultural resource management plan and consultation with Tribes.

- ERPA would acquire permits for the construction of the NERF, which would require compliance with federal and state cultural resource laws and may include the following actions:
  - Develop an APE in consultation with FERC, permitting agency, State Historic Preservation Officer (SHPO), Tribes, and stakeholders.
  - Conduct cultural resource studies to identify and evaluate cultural resources for listing in the NRHP and California Register of Historical Resources[3] within the NERF APE.
  - Comply with FERC's management plans such as a Programmatic Agreement and Historic Properties Management Plan that would include additional studies to identify and reduce effects to cultural resources from construction of the NERF.

Unavoidable Adverse Effects

Unavoidable adverse effects would be likely if cultural resources are identified in the proposed construction areas of the NERF and subsequent APE that cannot be avoided. FERC, PG&E, ERPA, and permitting agencies would be required to follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and Part 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with SHPO, Tribes, interested parties, and land-managing agencies; and developing a Section 106 agreement document (typically a Memorandum of Agreement or Programmatic Agreement) that resolves adverse effects.

[3] Resources will also be evaluated under the California Register of Historical Resources for use in the State Water Resources Control Board's impacts assessment under the California Environmental Quality Act.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

APE	Area of Potential Effects
CFR	Code of Federal Regulations
ERPA	Eel Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel Russian Facility
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project, FERC Project No. 77
SHPO	State Historic Preservation Officer
Tribes	California Indian Tribes
USACE	U.S. Army Corps of Engineers

This Page Intentionally Left Blank

3.5.1.13 Tribal Resources

This section discusses potential effects to Tribal resources that could occur from proposed activities on Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

Potential Effects

The criterion of adverse effect is defined in Section 106 of the National Historic Preservation Act (NHPA) implementing regulations at 36 CFR Part 800.5(a)(1). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Historic properties are defined as any district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. The term includes properties of traditional religious and cultural importance to California Indian Tribes (Tribes) that meet the criteria for inclusion in the NRHP, pursuant to the National Register criteria, 36 C.F.R. Part 63.

The Proposed Action for NPUPL qualifies as an "undertaking," as defined in Code of Federal Regulations (CFR) Part 800.16(y), with the potential to affect Tribal resources that could qualify as historic properties (36 CFR Part 800.3(a)). Activities to be implemented under the Proposed Action for NPUPL as well as the No-Action Alternative (existing condition) (Section 2.1) were analyzed for potential adverse effects to Tribal resources. Under Section 106 of the NHPA, the lead federal agency in consultation with Indian tribes that attach religious or cultural significance to Tribal resources that qualify as historic properties must reduce or mitigate adverse effects to these resources within the Area of Potential Effects (APE).[1]

Under the Proposed Action for NPUPL, construction of the New Eel-Russian Facility (NERF) on the Eel River would primarily involve repositioning sediment to facilitate construction access, constructing a retaining wall, placing fill behind the retaining wall, and constructing a new pump station and ancillary facilities. All of these activities would occur within the river immediately upstream of the existing Cape Horn Dam, on Project lands within the existing Federal Energy Regulatory Commission (FERC) Project Boundary. At the time of construction, the reservoir would be dewatered and the Eel River would be re-routed around the construction site to allow for removal of Cape Horn Dam.[2] Renderings depicting the NERF facilities on the Eel River during construction and upon completion are provided in Section 2.0, Figures 2-8 through 2-11. Based on

---

[1] An Area of Potential Effect (APE) has not been determined for the Proposed Action for NPUPL and will be developed in consultation with FERC, permitting agencies, State Historic Preservation Officer, Tribes, and stakeholders.

[2] Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

review of available information listed in Section 3.3.12 (Affected Environment Tribal Resources),[3] there is a high likelihood for the presence of Tribal resources including but not limited to: ethnohistoric villages, archaeological sites, human remains, Tribal ethnobiological resources (plants, animals, avian and aquatic species, and insects), trails and significant Tribal places, including ceremonial sites, in the NERF construction area. It is likely that unknown Tribal resources are present in this area as well. Potential adverse effects from construction of these components of the NERF to Tribal resources may include:

- Direct effects through physical destruction, damage, or removal of all or part of known and unknown Tribal resources;
- Direct effects through disturbance or destruction of human remains;
- Direct and indirect effects through change to the character, use, or physical and sensory setting of known and unknown Tribal resources that diminish the religious or cultural significance of the resource;
- Direct and indirect effects through the disruption in access and use of ethnobiological resources, ceremonial areas, and other Tribal activities from NERF construction activities;
- Indirect effects that disproportionately affect Tribal communities (see Section 3.5.1.15 for additional information); and
- Transfer, lease, or sale of historic property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

All NERF construction and staging areas would be located entirely within the existing FERC Project boundary. All land within the FERC Project Boundary is under FERC jurisdiction, and all activities within the FERC Project Boundary are subject to the terms and conditions outlined in Pacific Gas and Electric Company's (PG&E's) license for the Project. Any NPUPL activity (i.e., construction of the NERF facilities) must be authorized by FERC to ensure that non-Project activities are consistent with the Project license and purpose. Since the NERF would be located within the FERC Project boundary, the Eel-Russian Project Authority (ERPA) would be subject to the applicable terms and conditions contained in PG&E's FERC license, including applicable requirements related to the protection of environmental and cultural resources and compliance with the NHPA and the FERC license–specific cultural resource management plan. ERPA will also need to acquire separate permits for construction of the NERF from state and federal agencies such as a permit under Section 404 of the Clean Water Act, which requires compliance with the NHPA, for authorization from the U.S. Army Corps of Engineers (USACE) for the discharge of dredged or fill material into all waters of the United States.

[3] No resource-specific studies have been conducted to help identify the specific effects of PG&E's request to allow ERPA to construct the NERF on lands within the FERC Project boundary.

Effects from NERF Construction Activities on Flows, Water Quality, and Fish and Other Aquatic Species of Tribal Value

As described above, NERF construction would occur in a segment of the Eel River immediately upstream of the existing Cape Horn Dam that would be dewatered by PG&E for the deconstruction of Cape Horn Dam on Project lands within the existing FERC Project Boundary. During NERF construction, ERPA may need to maintain dewatered conditions because of groundwater or rainfall for specific NERF construction activities in the NERF construction area. Erosion from the NERF construction areas and the resulting runoff and turbidity due to dewatering could temporarily impact water quality in the Eel River downstream of the NERF construction area by increasing sedimentation and turbidity. The following potential effects will likely be avoided or minimized through water quality protection measures prescribed by permitting agencies such as the State Water Board and USACE. If erosion control and water quality measures are not implemented, then potential adverse effects of the NERF construction to hydrology and water use, water quality, and fisheries that may affect Tribal resources may include:

- Direct and indirect effects to native anadromous fish populations such as fall-run Chinook salmon, coho salmon, steelhead trout, and Pacific lamprey, plus freshwater mussels and invertebrates (see Section 3.5.1.4 for a detailed effects analysis for these species).
  - Measures to address and reduce potential effects from potential changes in hydrology, water quality, and aquatic habitat to fish and other aquatic species are discussed in Section 3.5.1.2, Section 3.5.1.3, and Section 3.5.1.4. With implementation of the water quality measures identified in Section 3.5.1.3, potential for water quality effects to the Eel River and aquatic species are considered negligible and no unavoidable adverse effects to water quality are expected from construction of the NERF. However, the permanent placement of approximately 0.86 acre of fill in Van Arsdale Reservoir may result in an unavoidable effect for critical habitat for ESA threatened California Coastal ESU Chinook salmon and Northern California DPS steelhead and habitat for other special-status species. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.
- Direct and indirect effects to water use and hydrology, water quality, and aquatic species and their habitats related to Tribal communities and Tribal resources (see Section 3.5.1.2, Section 3.5.1.3, and Section 3.5.1.4 for additional information).
  - Measures to address and reduce potential effects to downstream water quality, water use and hydrology, and aquatic species and their habitats are discussed in Section 3.5.1.2, Section 3.5.1.3, and Section 3.5.1.4. If it is necessary for PG&E to implement the East Branch Russian River Diversion Plan (see Section 2.2.3), NERF construction activities at the tunnel inlet would be coordinated with implementation of PG&E's plan, to assure that NERF construction activities at the tunnel inlet would not interfere with PG&E's ability to divert to the East Branch Russian River in compliance with the PG&E's East Branch Russian River Diversion Plan. During the license surrender proceeding, ERPA would develop a Construction East Branch Russian River Diversion Plan that would include measures for the coordination of NERF construction activities

with PG&E's East Branch Russian River Diversion Plan. With implementation of the water quality measures identified in Section 3.5.1.3, no unavoidable adverse effects to water quality are expected from construction of the NERF. However, the permanent placement of approximately 0.86 acre of fill in Van Arsdale Reservoir may result in an unavoidable effect for critical habitat for ESA threatened California Coastal ESU Chinook salmon and Northern California DPS steelhead and habitat for other special-status species. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

Environmental Measures

To comply with federal and state cultural resource laws and to avoid, reduce or mitigate potential adverse effects to Tribal resources:

- Any NPUPL activity (i.e., construction of the NERF facilities) must be authorized by FERC to ensure that non-Project activities are consistent with the Project license and purpose, including review of the proposed construction plan under the FERC license–specific cultural resource management plan and consultation with Tribes.
- ERPA would acquire permits for the construction of the NERF, which would require compliance with federal and state cultural resource laws and may include the following actions:
  – Develop an APE in consultation with FERC, permitting agencies, State Historic Preservation Officer (SHPO), Tribes, and stakeholders;
  – Conduct a Tribal resources study to identify and evaluate Tribal resources for listing in the NRHP and California Register of Historical Resources[4] within the NERF APE; and
  – Develop a management plan such as a Programmatic Agreement, Historic Properties Management Plan and/ or Construction Plan that will include additional studies to identify effects and measures to avoid or mitigate adverse effects to Tribal resources from construction of the NERF.

To avoid or reduce potential adverse effects to Tribal water quality and fisheries resources during construction, ERPA would obtain, prepare, and/or implement measures and plans identified in Section 3.5.1.3 and Section 3.5.1.4 and/or these measures would be prescribed by the permitting agencies as part of the permit. These measures and plans would be applied during implementation of the Proposed Action. A complete list of construction measures is included in Section 2.2.3. Construction would also include obtaining and implementing resource agency and construction permits, following water quality best management practices, and complying with local, state, and federal laws:

- USACE Section 404 Clean Water Act Permit;

[4] Resources will also be evaluated under the California Register of Historical Resources for use in the State Water Resources Control Board's impacts assessment under the California Environmental Quality Act.

- State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification; and
- State Water Resources Control Board Construction General Permit/Stormwater Pollution Prevention Plan.

Unavoidable Adverse Effects

Unavoidable adverse effects would be likely if Tribal resources and archaeological sites that qualify as Tribal resources are identified in the proposed construction areas of the NERF and subsequent APE that cannot be avoided. FERC, PG&E, ERPA, and permitting agencies would be required to follow the Section 106 process pursuant to 36 CFR Part 800.5 for *assessment of adverse effects* and Part 800.6 for *resolution of adverse effects*. Resolution of an adverse effect, as defined in 36 CFR Part 800.6, requires notifying the Advisory Council on Historic Preservation; consulting with the SHPO, Tribes, interested parties, and land managing agencies; and developing a Section 106 agreement document (typically a Memorandum of Agreement or Programmatic Agreement) that resolves adverse effects.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company

This Page Intentionally Left Blank

3.5.1.14 Socioeconomic Resources

This section describes the potential effects to socioeconomic resources that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in socioeconomic resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following aspects of socioeconomic resources may be potentially affected by construction of the New Eel-Russian River Facility (NERF):

- Water reliability and cost,
- Economic opportunity,
- Population and housing,
- Local government fiscal stability and revenues,
- Habitat and species-related cultural and economic values,
- Recreation value, and
- Community way of life.

The Analysis Area is limited to the NERF construction footprint, which includes the work and staging areas in the immediate vicinity of Cape Horn Dam and a limited area in and around the Potter Valley Powerhouse and the surrounding local area. The entire NERF construction footprint will be within the existing FERC Project boundary.

Potential Effects of NERF Construction Activities on Water Reliability and Cost

ERPA would construct the NERF retaining wall, add fill material behind the retaining wall, and construct the new pump station during the low-flow season (May–October) when the Eel River flows are rerouted and the area is dewatered for Pacific Gas and Electric Company's (PG&E) deconstruction of Cape Horn Dam and associated facilities (Section 2.2.1). During construction of the retaining wall and prior to filling behind the retaining wall, ERPA may need to maintain dewatered conditions because of groundwater or rainfall for specific NERF construction activities in the NERF construction area. ERPA would install the energy dissipation valve and instrumentation at the existing Potter Valley Powerhouse and maintenance yard during the low-flow season. Installation of the valve would not affect potential release of flows through the powerhouse bypass system into the East Branch Russian River.

As noted in Section 3.5.1.2, during construction of the NERF, there would be no effects on hydrology in the Eel River. During construction of the NERF, Eel River flows would be routed through the bypass channel, around the construction area, and back into the Eel River channel downstream of the lower cofferdam installed to dewater the Cape Horn Dam Area[1] (refer to Section 2.2.2).

Diversion of water to the East Branch Russian River may occur via new pumps installed upstream of the construction site.[2] If it is necessary for PG&E to implement the East Branch Russian River Diversion Plan (see Section 2.2.3), NERF construction activities at the tunnel inlet would be coordinated with implementation of PG&E's plan. If NERF construction activities at the tunnel inlet prohibit PG&E's ability to divert to the East Branch Russian River, NERF construction would result in an unavoidable adverse effect to the East Branch Russian River during construction. ERPA would develop a Construction East Branch Russian River Diversion Plan that would include measures for the coordination of NERF construction activities with PG&E's East Branch Russian River Diversion Plan and measures to limit the duration of time without pumping to the extent feasible. Nonetheless, there may be a short-term halt in diversions to the East Branch Russian River when the NERF is connected which could temporarily and adversely affect flows for a short time period.

Installation of the energy dissipation valve at the Potter Valley Powerhouse would not affect the ability to release flow into the East Branch Russian River during construction. Accordingly, while there may be a temporary cessation of diversions during NERF construction when the NERF is connected, there are no expected effects of NPUPL on overall water reliability or cost relative to existing conditions during the construction period.

Potential Effects of NERF Construction Activities on Economic Opportunity

Construction of the NERF would increase spending in the local area and spur short-term local economic activity, directly and indirectly supporting economic opportunity in the Analysis Area. The magnitude of this short-term boost to jobs and income in local construction and related sectors depends on several factors, including the total construction budget, the proportion of the construction budget that is for labor versus materials/equipment, and the source location of construction labor, equipment, and materials (i.e., whether these are sourced locally or from outside the region). Higher levels of total construction spending, higher proportion of budget spent on labor, and higher proportion of labor and materials sourced from within the region would result

---

1 Installation of cofferdams, dewatering of and bypassing flows around the construction area, and removal of the cofferdams and restoration of the reservoir footprint following construction are components of PG&E's Surrender Application Proposed Action.

2 During construction, if the upstream cofferdam is required to be installed in the Eel River above the Van Arsdale Diversion, the diversion would not be operable and water diversions into the East Branch Russian River would cease. PG&E would implement the East Branch Russian River Diversion Plan that would include measures to continue providing water to the East Branch Russian River during construction (see Section 2.2.3).

in greater beneficial economic opportunity effects. Current data on these three key factors are not available. However, the impact on the local economy is expected to be beneficial.

Potential Effects of NERF Construction Activities on Population and Housing

Small effects on population and housing are possible that could increase the local population and demand for housing. Effects are expected to be limited due to the short-term nature of the construction, the likelihood that many construction workers would be local residents, and the likelihood that non-local construction workers may find lodging in numerous places throughout the area rather than concentrating in one location.

Potential Effects of NERF Construction Activities on Local Government Fiscal Conditions and Stability

NERF construction would increase traffic on public roadways by heavy construction vehicles that could damage roadways and increase maintenance costs. However, as noted in the land use analysis (see Section 3.5.1.9), all roadways within the FERC Project boundary would be restored to existing condition, and all other roadways would also be restored as agreed upon under conditions of transportation permits from California Department of Transportation or the county. As such, effects on local government road maintenance costs are expected to be negligible.

Land use would remain unchanged relative to existing conditions (see Section 3.5.1.9) such that effects of construction on local government property tax revenues are expected to be negligible. Similarly, NERF-related economic activity may increase local sales tax receipts, with a negligible to beneficial impact on local government fiscal conditions.

Potential Effects of NERF Construction Activities on Habitat and Species-Related Cultural and Environmental Values

While construction activities have the potential to affect aquatic species and habitats through direct disturbance and changes in water quality, these effects would be negligible with adherence to proposed measures to protect aquatic species and water quality (see Section 3.5.1.4). However, modification of a small area of aquatic habitat potentially used by many aquatic species would occur with the placement of fill (approximately 0.86 acre) within the NERF footprint. This fill in the river channel/floodplain may affect habitat of aquatic species with Tribal cultural value and socioeconomic value to other communities including fall-run Chinook salmon, coho salmon, steelhead trout, and Pacific lamprey. These potential adverse effects may be particularly experienced by conservationists, Tribal members, and others who value species and habitat conservation.

Potential Effects of NERF Construction Activities on Recreation Value

As described in the recreation resources analysis (see Section 3.5.1.10), construction of the NERF would have no effect on recreation use or opportunities on the Eel River compared to existing conditions. Further, as there are no developed recreation facilities near the Potter Valley Powerhouse, construction of the NERF would have no effect on recreation use or value near the powerhouse. Finally, as flows in the Russian River are expected to continue during construction, with the possible exception of the time period when the NERF is being connected, negligible effects are expected on recreation value in the Russian River Watershed.

Potential Effects of NERF Construction Activities on Community Way of Life

People in the vicinity of the NERF site could experience aesthetic (Section 3.5.1.11), noise, vibration, and dust impacts during construction activities. However, these potential effects on the community way of life are expected to be negligible given the lack of residences and businesses proximate to the NERF site.

Construction of the NERF could also affect fire risk (Section 3.5.1.9), water quality (Section 3.5.1.3), and local traffic, along with possible release of fuels or other hazardous materials during construction. However, implementation of environmental measures would reduce these impacts to negligible levels.

Environmental Measures

To avoid or reduce effects to socioeconomic resources, ERPA would implement the following measures that have been developed to address effects to associated resources. A complete list of environmental measures is included in Section 2.2.3.

- Implementation of a Construction Aquatic Species Management and Monitoring Plan (see Section 3.5.1.4).
- Land Use Measures, including restoring roads affected by the Proposed Action and implementing best management practices (see Section 3.5.1.9)
- Fire Prevention and Suppression Measures, including implementation of a construction fire plan (see Section 3.5.1.9).
- Hazardous Materials Measures, including implementation of a spill prevention, control, and countermeasures plan (see Section 3.5.1.3).
- Water Quality and Erosion Control Measures, including implementation of a construction site dewatering plan and erosion prevention plan (see Section 3.5.1.3).

Unavoidable Adverse Effects

No unavoidable adverse effects are expected to occur to socioeconomic resources from construction of the NERF.

TABLE OF CONTENTS

List of Maps

List of Acronyms

EJ	environmental justice
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
mi.	mile
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
Project	Potter Valley Hydroelectric Project
USEPA	U.S. Environmental Protection Agency

This Page Intentionally Left Blank

3.5.1.15 Environmental Justice

This section describes the potential effects to environmental justice that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in environmental justice that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effect to environmental justice resulting from construction of the New Eel-Russian Facility (NERF) was analyzed:

- Potential impacts from NERF construction activities may disproportionately and adversely affect environmental justice (EJ) communities.

Approach to Analysis

Consistent with guidance provided by the U.S. Environmental Protection Agency (USEPA), this analysis relies on demographic data from the U.S. Census Bureau to identify potential EJ communities using the “50 percent” and “meaningfully greater” analysis methods (USEPA 2016). The approach to analysis is described in detail in Section 3.3.14.4.

The discussion below is organized by census block group within the Analysis Area, which is defined as the area within the Federal Energy Regulatory Commission (FERC) Project boundary around the NERF construction area and a 5-mile (mi.) buffer area. As shown on Map 3.5.1.15-1, this area overlaps the Cape Horn Dam area, and portions of the Eel River and Russian River watersheds. Therefore, to avoid redundancy, the following discussion is organized by the five census block groups that intersect the Analysis Area rather than by individual region. It is noted that the construction area for the NERF is located within Mendocino County Tract 108.02 Block Groups 1 and 2 only.

Lake County, Tract 1, Block Group 1

Lake County Tract 1 Block Group 1 overlaps Scott Dam, Lake Pillsbury, the surrounding recreation facilities (see Map 3.5.1.15-1), and the Eel River to the upper end of Van Arsdale Reservoir. The percentage of the minority population in the census block group included in the analysis was determined to be 35 percent (see Table 3.3.14-1 in Section 3.3.14). The census block group was not identified to be an EJ community using the “50 percent” analysis method, “meaningfully greater” analysis method, or the “low-income threshold criteria” method.

In addition, direct construction effects associated with the NPUPL would be geographically limited to the NERF construction area, which includes the Potter Valley Powerhouse site and the Cape Horn Dam area. No direct construction work would take place within Lake County Tract 1 Block Group 1.

Since there are no identified EJ communities or construction work in this area, there would be no effects on EJ communities within Lake County Tract 1 Block Group 1.

Mendocino County, Tract 106, Block Group 1

A small portion of Mendocino County Tract 106 Block Group 1 intersects the northwest portion of the Analysis Area northwest of Cape Horn Dam and abuts the south side of the Eel River (see Map 3.5.1.15-1). This census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method. In addition, direct construction effects associated with the NPUPL would be geographically limited to the NERF construction area, which includes the Potter Valley Powerhouse site and the Cape Horn Dam area. No direct construction work would take place within Mendocino County Tract 106 Block Group 1.

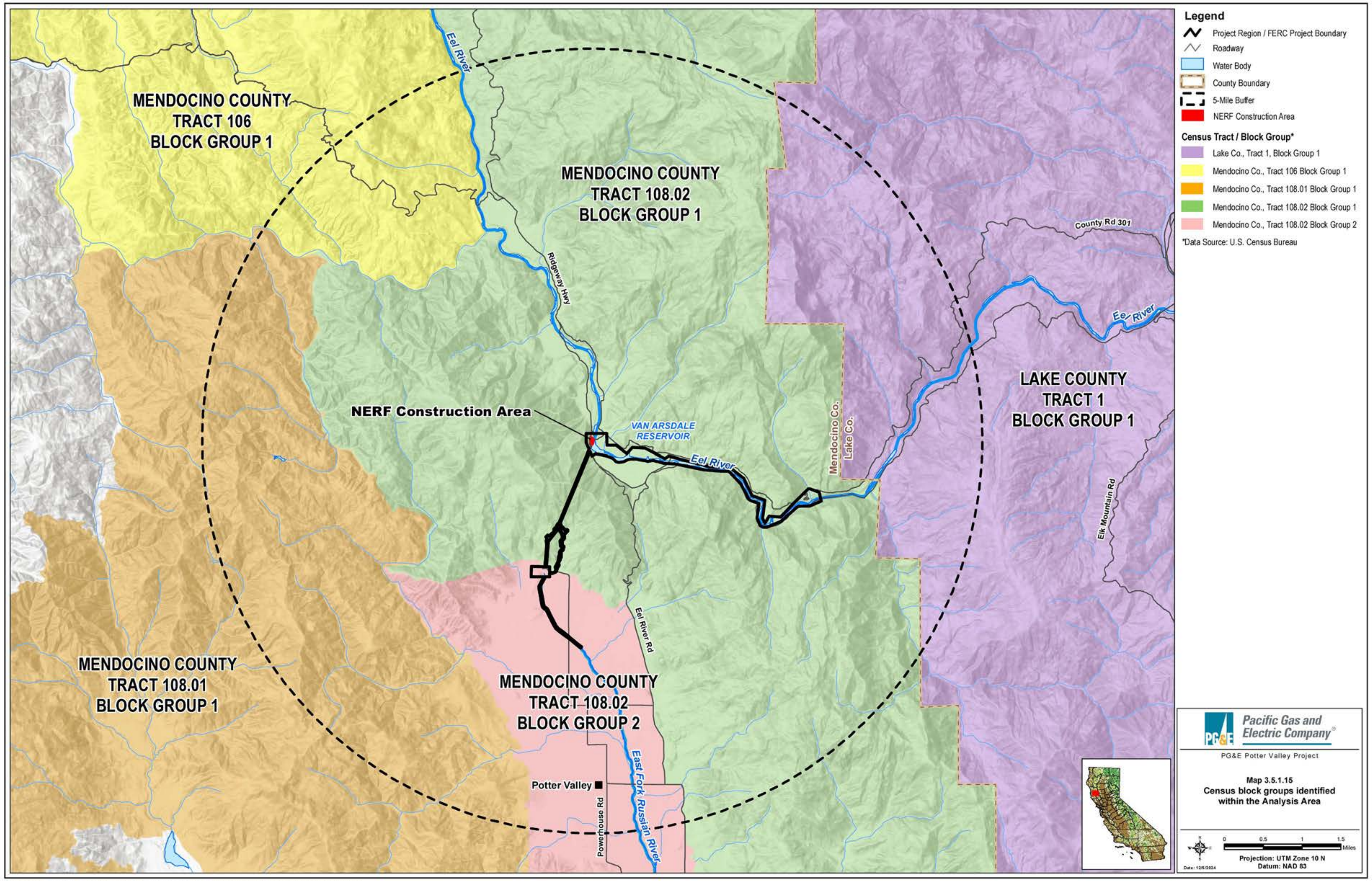
Since there are no identified EJ communities or construction work in this area, there would be no effects on EJ communities within Mendocino County Tract 106 Block Group 1.

Mendocino County, Tract 108.01, Block Group 1

A portion of Mendocino County Tract 108.01 Block Group 1 intersects the Analysis Area west of Cape Horn Dam and west of the East Branch Russian River (see Map 3.5.1.15-1). This census block group is located north of the city of Ukiah and does not include any incorporated cities or towns. Mendocino County Tract 108.01 Block Group 1 was determined to meet the criteria as an EJ community using the "meaningfully greater" analysis method and the "low-income threshold criteria" method (see Section 3.3.14). However, direct construction effects associated with the NPUPL would be geographically limited to the NERF construction area. No direct construction work would take place within Mendocino County Tract 108.01 Block Group 1. Therefore, construction of the NERF would have no effect on the EJ communities within Mendocino County Tract 108.01 Block Group 1.

Mendocino County, Tract 108.02, Block Group 1

Mendocino County Tract 108.02 Block Group 1 overlaps much of the Cape Horn Dam Area as well as portions of the Eel River downstream of Cape Horn Dam (see Map 3.5.1.15-1). The census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method. Since there are no identified EJ communities or construction work in this area, there would be no effects on EJ communities within Mendocino County Tract 108.02 Block Group 1.



Map 3.5.1.15-1. Census block groups identified within the Analysis Area.

This Page Intentionally Left Blank

Mendocino County, Tract 108.02, Block Group 2

Potter Valley Powerhouse is located in Mendocino County Tract 108.02 Block Group 2. The census block group was not identified to be an EJ community using the "50 percent" analysis method, the "meaningfully greater" analysis method, or the "low-income threshold criteria" method. Accordingly, construction of the NERF, including installation of an energy dissipation valve and associated instrumentation in the Potter Valley Powerhouse, would have no effect on EJ communities within Mendocino County Tract 108.02 Block Group 2.

Environmental Measures

Implementation of the Proposed Action is not expected to result in disproportionate or adverse impacts to EJ communities in the Analysis Area or surrounding region. Therefore, construction and environmental measures are not necessary or proposed.

Unavoidable Adverse Effects

Implementation of the Proposed Action would not result in unavoidable adverse effects to EJ communities.

References

U.S. Environmental Protection Agency. 2016. Promising practices for EJ methodologies in NEPA reviews. Available at: https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf. Accessed December 2024.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

BMP	best management practices
EFH	essential fish habitat
ERPA	Eel-Russian Project Authority
FERC	Federal Energy Regulatory Commission
NERF	New Eel-Russian Facility
NPUPL	Non-Project Use of Project Lands
PG&E	Pacific Gas and Electric Company

This Page Intentionally Left Blank

3.5.1.16 Marine Resources

This section describes the potential effects to marine resources (species and habitat; Section 3.3.18) that could occur from Non-Project Use of Project Lands (NPUPL). The Proposed Action for NPUPL is described in Section 2.2.2.

The effects are determined by analyzing the changes in marine resources that may result from activities to be implemented under the Proposed Action compared to the No-Action Alternative (existing condition) (Section 2.1).

Final effects determinations consider measures (i.e., construction measures) to be implemented by the Eel-Russian Project Authority (ERPA) to avoid or mitigate impacts associated with implementation of the Proposed Action (refer to Section 2.2.3). Unavoidable adverse effects are discussed at the end of this section.

Potential Effects

The following potential effects to marine resources resulting from construction of the New Eel-Russian Facility (NERF) were analyzed:

- Potential effects of increased turbidity and suspended sediment during construction.
- Potential effects of pollutant spills of oil, fuel, or other toxic materials.
- Potential effects of water contamination from stormwater or nutrient and bacterial runoff.

For the purposes of this section, the Analysis Area for marine resources is the lower Eel River (located from Fernbridge and downstream to the mouth), Eel River estuary, and ocean. The Eel River estuary is located approximately 156 miles downstream from the NERF construction area.

Potential Effects of NERF Construction Activities on Increased Turbidity or Suspended Sediment on Marine Resources

Under the Proposed Action, construction of the NERF would primarily involve repositioning sediment to facilitate construction access, constructing a retaining wall, placing a conduit between the pump station and tunnel inlet and fill behind the retaining wall, and constructing a new pump station and ancillary facilities. All of these activities would occur within a construction footprint immediately upstream of the existing Cape Horn Dam (see Map 2-11a). Construction would occur from approximately May 1 to October 31, depending on weather conditions. As discussed in Section 3.5.1.3 Water Quality, NERF construction activities have the potential to cause a temporary increase in turbidity and suspended sediment in the Eel River downstream of the construction site due to ground-disturbance. This reduction in water quality is unlikely to affect marine species and essential fish habitat (EFH) (Section 3.3.18) by reducing habitat quality in the lower Eel River, Eel River estuary, and ocean.

ERPA would implement water quality and erosion control measures to address and reduce the potential for increased suspended sediment loads and turbidity during NERF construction activities. Construction measures include a Construction Site Dewatering Plan, Construction Water Quality Monitoring Plan, best management practices (BMPs), and an Erosion Prevention Plan. In addition, ERPA would obtain applicable resource agency and construction permits. With these measures, the potential for an increase in turbidity and suspended sediment and related water quality impacts to marine species and habitat in the lower Eel River, Eel River estuary, and ocean are considered negligible.

Potential Effects of NERF Construction Activities on Accidental Pollutant Spills on Marine Resources

NERF construction activities would include the use of a variety of chemicals such as fuels, lubricants, paints, solvents, and construction materials. Improper handling, storage, or accidental spills of these chemicals could result in pollutants entering soil or surface water if not managed correctly. Activities associated with NERF construction could increase the potential for accidental spills and pollutants to be introduced into the Eel River. This potential reduction in water quality could affect marine species and EFH (Section 3.3.18) by reducing habitat quality in the lower Eel River, Eel River estuary, and ocean.

To address and reduce the potential for accidental pollutant spills, ERPA would implement construction-related BMPs to control spills; have emergency cleanup equipment readily available onsite; and implement a Spill Prevention, Control, and Countermeasures (SPCC) Plan, with protocols for preventing spills and managing incidents should they occur. In addition, ERPA would obtain applicable resource agency and construction permits. With adherence to the above measures, potential effects to marine species and habitat in the lower Eel River, Eel River estuary, and ocean environment from pollutant spill contamination related to NERF construction are reduced to a negligible level.

Potential Effects of NERF Construction Activities on Contamination from Stormwater or Nutrient and Bacterial Runoff on Marine Resources

Construction activities could temporarily alter natural drainage patterns. Without proper stormwater management practices such as silt fencing, straw/hay bales, or vegetative buffers, runoff from rainfall events could also transport pollutants from the construction site into the Eel River. Excess nutrients or bacteria (i.e., contaminants) could enter the Eel River if weather events coincide with the construction activity. This reduction in water quality could directly affect marine species and EFH (Section 3.3.18) by reducing habitat quality in the lower Eel River, Eel River estuary, and ocean.

ERPA would include water quality and erosion control measures that would be implemented at the construction activity locations described above. Construction measures include a Stormwater Pollution Prevention Plan (SWPPP) and Erosion Plan. In addition, ERPA would obtain applicable resource agency and construction permits. With these measures, the potential for contamination from stormwater and nutrient/bacterial runoff and related water quality impacts to marine species and habitat in the lower Eel River, Eel River estuary, and ocean is considered negligible.

Environmental Measures

To avoid affecting marine species (Section 3.3.18) and EFH in the lower Eel River, Eel River estuary, and ocean during construction, ERPA would obtain, prepare, and/or implement the following measures and plans. These measures and plans would be applied during implementation of the Proposed Action. A complete list of construction measures is included in Section 2.2.3.

- Construction Site Dewatering Plan;
- Construction Water Quality Monitoring Plan;
- Best Management Practices (BMPs);
- Erosion Prevention Plan
- Stormwater Pollution Prevention Plan (SWPPP);
- Hazardous Materials Measures
  - Spill Prevention, Control, and Countermeasure (SPCC) Plan
  - Construction-related BMPs
  - Required compliance with applicable local, state, and federal standards associated with handling and disposal of hazardous materials
- Installation of Sanitary Facilities (with secondary containment)

Construction also would include obtaining and implementing resource agency and construction permits, following water quality best management practices, and complying with local, state and federal laws (e.g., Basin Plan water quality requirements):

- United States Army Corps of Engineers Section 404 Clean Water Act Permit;
- State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification; and
- State Water Resources Control Board Construction General Permit/SWPPP.

Unavoidable Adverse Effects

Construction of the NERF would not result in unavoidable adverse impacts to marine resources.

This Page Intentionally Left Blank

TABLE OF CONTENTS

List of Acronyms

AB	Assembly Bill
BMP	best management practice
Cal Trout	California Trout
cfs	cubic feet per second
ERPA	Eel-Russian Project Authority
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FYLF	foothill yellow-legged frog
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
NERF	New Eel-Russian Facility
NOAA	National Oceanic and Atmospheric Administration
NPUPL	Non-Project Use of Project Lands
OHWM	ordinary high water mark
PG&E	Pacific Gas and Electric Company
Project	Potter Valley Hydroelectric Project
PVID	Potter Valley Irrigation District
SWPPP	Stormwater Pollution Prevention Plan
TMDL	total maximum daily load

This Page Intentionally Left Blank

3.5.2 Cumulative Effects

This Section 3.5.2 addresses the cumulative effects of the Non-Project Use of Project Lands (NPUPL) Proposed Action, as defined in Section 2.2.

A cumulative effect is defined in this document to be the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

The section evaluates cumulative effects of the authorization of the NPUPL Proposed Action that includes construction of the New Eel-Russian Facility (NERF) pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River; construction of a conduit from the pump station to the tunnel inlet, retaining wall, and fill behind the retaining wall; and modification of the Potter Valley Powerhouse (see Section 2.2.2 for more detail). The cumulative effects associated with Pacific Gas and Electric Company's (PG&E's) proposed decommissioning and restoration plans are evaluated in Section 3.4.2.

3.5.2.1 Cumulatively Affected Resources

The resources considered for inclusion in the cumulative impacts analysis of this NPUPL Proposed Action were identified based on information contained in the Application for Surrender of License and a review of technical information developed in support of this document.

For this analysis, resources that may be affected cumulatively by the incremental effects of the NPUPL Proposed Action in combination with past, present, and reasonably foreseeable future actions include water use and hydrology, water quality, fish and aquatic resources, botanical resources, wildlife resources, geomorphology, cultural resources, and Tribal resources.

Additional information on these resources can be found in the following sections and in Sections 3.3 and 3.5.1.

3.5.2.2 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the NPUPL Proposed Action's effects on resources when considering effects from other projects. These boundaries are defined to include the NPUPL Proposed Action's effects on the resources. The geographic scope includes the footprint of the NERF construction area at Cape Horn Dam and the footprint of the NERF construction at the Potter Valley Powerhouse, as well as the Eel River downstream of Lake Pillsbury to the ocean and the East Branch Russian River between the Potter Valley Powerhouse and Lake Mendocino.

3.5.2.3 Temporal Scope

The temporal scope of the cumulative effects analysis includes past, present, and reasonably foreseeable future actions and their possible cumulative effect on each resource listed above. The timeframe for the cumulative effects analysis is the duration of deconstruction activities.

3.5.2.4 Past, Present, and Reasonably Foreseeable Actions

The NPUPL Proposed Action is the authorization of construction of the NERF pump station to divert and convey water to the existing Van Arsdale tunnel inlet for future diversion to the East Branch Russian River; construction of a conduit from the pump station to the tunnel inlet, retaining wall, and fill behind the retaining wall; and modification of the Potter Valley Powerhouse. Other reasonably foreseeable actions considered in this cumulative effects section include:

- **PG&E's decommissioning of Scott Dam and Cape Horn Dam**. PG&E's proposed decommissioning plan and restoration plan are provided in Section 2.2.1, and effects of this decommissioning and restoration are evaluated in Section 3.4. PG&E will decommission Scott Dam and Cape Horn Dam such that no water is impounded, volitional fish passage and unimpaired flows occurs, and PG&E's generation capabilities are eliminated.
- **Operation of the NERF to continue diverting water to the East Branch Russian River for use by the Eel-Russian Project Authority (ERPA)**. Once completed, operation of the NERF will result in the continued diversion of water from the Eel River into the East Branch Russian River. The effects of proposed long-term operation of the NERF is described in Section 3.4.2.5.
- **Implementation of fisheries restoration plans and projects identified in Eel River Restoration and Conservation Plan** (Cal Trout *et al.* 2024). Phase 1 of the Eel River Restoration and Conservation Plan was finalized in June of 2024. The overarching goal of the plan is to build on existing restoration actions in the watershed, including the removal of Scott and Cape Horn dams. Additional information regarding this plan is provided in Section 3.4.2.
- **Development and implementation of total maximum daily loads (TMDLs) in the watershed** (U.S. Environmental Protection Agency 2004, 2005, 2007). Additional information regarding this action is provided in Section 3.4.2.4. Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would reduce elevated levels of sediment and pollutants in the rivers and would result in an overall cumulative benefit to hydrology resources, water quality, and geomorphic processes, which would benefit aquatic, wetland, and riparian habitats, fish and aquatic species, and aquatic foraging species such as bald eagle, osprey, and special-status bats. Implementation of these TMDLs is expected to retain or restore beneficial uses of freshwater habitat (e.g., salmonid habitat) by reducing sediment load and temperature and address declines of salmon and steelhead populations in the watersheds. The NPUPL Proposed Action's contribution to the beneficial cumulative effects of implementing TMDLs for water quality with the implementation of water quality and erosion control measures would be negligible.

- **Implementation of recovery actions for federally protected California Coastal Chinook salmon and the Northern California steelhead distinct population segment pursuant to the Coastal Multispecies Recovery Plan** (National Oceanic and Atmospheric Administration [NOAA] 2016). Additional information regarding this plan is provided in Section 3.4.2.
- **Eel River – Trout Creek and Alder Creek land acquisition, Potter Valley Tribe**. Additional information regarding this plan is provided in Section 3.4.2.4.
- **Climate change effects including potential reductions in snowpack, shifts in precipitation from snow to rain, earlier runoff, more frequent and intense storms, increased occurrence and severity of wildfires, and warming air temperatures.** These changes could alter the historical timing, magnitude, and quality of flows in the Eel River and East Branch Russian River watersheds, increase water temperatures, and, in the case of wildfire, reduce vegetation cover in burned areas that could result increased sediment loading into waterways. Increased severity of wildfires due to climate change can also result in the loss of habitat for sensitive species and cultural and Tribal resources.

3.5.2.5 Cumulative Effects Analyses

The NPUPL Proposed Action is expected to have short-term unavoidable adverse effects on environmental, cultural, and Tribal resources. These effects are summarized in Volume I, Section 6. In the following sections, specific existing or foreseeable activities that may cumulatively affect environmental and cultural resources are described, and a summary of the cumulative effects of the NPUPL Proposed Action along with other existing or foreseeable activities is provided.

Water Use and Hydrology

The NPUPL Proposed Action (Section 2.2.2) includes environmental measures to protect water use and hydrology during construction (Construction Site Dewatering Plan, Construction East Branch Russian River Diversion Plan). NERF construction is not anticipated to result in adverse effects to water use and hydrology; however, NERF construction activities at the tunnel inlet would be coordinated with implementation of PG&E's plan, to assure that NERF construction activities at the tunnel inlet would not interfere with PG&E's ability to divert to the East Branch Russian River in compliance with the PG&E's East Branch Russian River Diversion Plan.

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in negligible to beneficial cumulative effects to water use and hydrology.

- PG&E's decommissioning of Scott Dam and Cape Horn Dam would return the Eel River and East Branch Russian River above Lake Mendocino to natural flows. Water diversions to the East Branch Russian River would cease. There would be an unavoidable adverse effect on the Potter Valley Irrigation District (PVID) water supply and an unavoidable adverse effect on existing condition hydrology in the East Branch Russian River. PG&E's removal of Cape Horn Dam, and ERPA's construction of some components of the NERF under the NPUPL Proposed Action, would occur at the same time. PG&E's decommissioning would have a neutral cumulative effect on the NPUPL Proposed Action (construction of certain components of the NERF). The NPUPL Proposed Action (Section 2.2.2) and construction of the other components required for the operations of the NERF, however, would facilitate water diversions to the East Branch Russian River (see bullet below). NERF diversions to the East Branch Russian River along with protection of Eel River flows would have a long-term cumulative beneficial effect on PVID water supply and hydrology in the East Branch Russian River and a neutral cumulative effect on hydrology in the Eel River.

- The NPUPL Proposed Action includes construction activities in the Eel River and adjacent staging areas. Operation of the NERF would require additional construction activities outside of the channel, and once completed, operation of the NERF would result in the continued diversion of water from the Eel River into the East Branch Russian River (see Section 3.4.2.5 and Table 3.4.2-1). ERPA would be required to obtain separate permits for completing construction of the NERF and for operation of the facility by ERPA, including a National Marine Fisheries Service biological opinion that would include flow protection measures in the Eel River related to Chinook salmon and steelhead. Operation of the NERF diversions would increase flows to PVID and the East Branch Russian River compared to PG&E's Proposed Action. NERF diversions would depend on seasonal water availability of the unimpaired Eel River and maintaining protection of flow in the Eel River below the NERF. The proposed NERF diversions would more closely resemble the pattern of a natural hydrograph compared to the existing condition. Diversion amounts to PVID would be below PVID's current diversions; summer flows in the East Branch Russian River would be very low during the summer/fall season (e.g., 1 cubic foot per second [cfs]). The NPUPL Proposed Action (construction of components of the NERF) and NERF diversion operations, however, would be a cumulative benefit to PVID water supply and long-term hydrology in the East Branch Russian River and be protective of flows in the Eel River.
- The Eel River Restoration and Conservation Plan identifies several potential activities that would be implemented, including those that would benefit Eel River flows, such as riparian and wetland restoration and instream flow protection. Implementation of the Eel River Restoration and Conservation Plan and the NPUPL Proposed Action would result in a neutral to beneficial cumulative effect on water use and hydrology in the Eel River.
- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would include some measure of watershed protection/restoration. Implementation of TMDLs and the NPUPL Proposed Action would result in long-term cumulative neutral or beneficial effects to hydrology resources in the Eel and East Branch Russian rivers.
- Implementation of the Coastal Multispecies Recovery Plan (NOAA 2016) restoration activities in the watershed may benefit natural hydrology in the Eel River. Therefore, implementation of NOAA's Coastal Multispecies Recovery Plan and the NPUPL Proposed Action would have neutral to beneficial cumulative effects on hydrology in the Eel River.

- The Potter Valley Tribe Trout Creek and Alder Creek land acquisition and proposed activities (developing recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, managing wildfire and fuels) would likely result in neutral to beneficial cumulative effects to water use and hydrology in the Eel River compared to the NPUPL Proposed Action.
- Climate change effects, including potential reductions in snowpack, shifts in precipitation from snow to rain, earlier runoff, more frequent and intense storms, increased occurrence and severity of wildfires, and warming air temperatures, could alter the historical timing, magnitude, and quality of flows in Eel River and East Branch Russian River watersheds. The combination of climate change, the NPUPL Proposed Action construction of components of the NERF, and subsequent NERF operations, including protection of flows in the Eel River, would have overall cumulative beneficial effects to water use and hydrology in the East Branch Russian River and neutral cumulative effects on water use and hydrology in the Eel River.

Water Quality

The NPUPL Proposed Action (Section 2.2.2) includes environmental measures to protect water quality during construction (Construction Site Dewatering Plan, Construction Water Quality Monitoring Plan, Construction Best Management Practices [BMPs], Construction East Branch Russian River Diversion Plan, Stormwater Pollution Prevention Plan [SWPPP], Construction Erosion Prevention Plan, Hazardous Materials Handling Measure, and state and federal construction permits). NERF construction is not anticipated to have adverse effects to water quality.

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in negligible to beneficial cumulative effects to water quality.

- PG&E's decommissioning of Scott Dam and Cape Horn Dam would return the Eel River and East Branch Russian River above Lake Mendocino to natural flows. Water diversions to the East Branch Russian River would cease. There would be a long-term unavoidable adverse effect on existing spring and summer cold-water conditions in the Eel River from below Scott Dam to a few miles below Cape Horn Dam and in the East Branch Russian River. PG&E's removal of Cape Horn Dam and construction of components of the NERF under the NPUPL Proposed Action would occur at the same time. PG&E's decommissioning would have a neutral cumulative effect on the NPUPL Proposed Action (construction of components of the NERF) water quality. The NPUPL Proposed Action (Section 2.2.2) and construction of the other components required for the operations of the NERF, however, would facilitate water diversions to the East Branch Russian River (see Water Use and Hydrology above), and this, along with protection of Eel River flows, would have a long-term cumulative beneficial effect to water temperature/water quality in the East Branch Russian River (see discussion below) and a neutral cumulative effect on water quality in the Eel River.

- As discussed in the Water Use and Hydrology section above (also see Section 3.4.2.5), operation of the NERF would result in diversion of Eel River water to the East Branch Russian River following removal of Cape Horn Dam and Lake Pillsbury storage. The NERF diversions would depend on seasonal water availability of the unimpaired Eel River and maintaining protection of flow in the Eel River below the NERF facility. The proposed NERF diversions would more closely resemble the pattern of a natural hydrograph compared to the existing condition. Average monthly diversions in the drier months, July through October, would be low, 1 cfs to 6 cfs, and in the wetter months, December through April, would increase up to 55 cfs to 120 cfs (depending on the upper or lower limit scenario) (Table 3.4.2-1). The low summer diversion would provide limited direct surface flow to the East Branch Russian River, but it is anticipated that the earlier season flows would help maintain groundwater levels and result in some level of groundwater inflow to the East Branch Russian River in the summer/fall. In combination with the NPUPL Proposed Action (that includes the construction of certain components of the NERF but would not include operation of the NERF), the NERF diversions would have a cumulative benefit to water temperature and water quality in the East Branch Russian River above Lake Mendocino and a neutral cumulative effect on water quality in the Eel River.
- Implementation of TMDLs in the Eel River and East Branch Russian River watersheds would involve activities to manage and improve water quality, including water temperature, sediment, and aluminum. The NPUPL Proposed Action would not affect sediment, and in combination with operation of the NERF would have a beneficial effect on water temperature in the East Branch Russian River and protect conditions on the Eel River (see above). Implementation of the TMDLs and the NPUPL Proposed Action would have a long-term cumulative benefit to water quality.
- Implementation of the fisheries restoration plans and projects identified in the Eel River Restoration and Conservation Plan would include activities to improve water quality and water temperature, restore riverine and estuary habitats, and control sediment entering waterways. Implementation of these plans would result in a neutral to beneficial cumulative effect on water quality compared to the NPUPL Proposed Action.
- The Potter Valley Tribe acquired approximately 879 acres of forested lands in the Eel River Watershed under the Eel River – Trout Creek and Alder Creek land acquisition. Plans associated with this acquisition include assisting with restoration of habitat and fisheries resources and wildfire and fuels management. Therefore, in combination with the NPUPL Proposed Action, this land acquisition would likely result in neutral to beneficial cumulative effects to water quality.
- Climate change effects to the Eel River Watershed include potential reductions in snowpack, shifts in precipitation from snow to rain, earlier runoff, more frequent and intense storms, increased occurrence and severity of wildfires, and warming air temperatures. These changes could alter the historical timing, magnitude, and quality of flows in Eel River Watershed, increase water temperatures, and, in the case of fire, reduce vegetation cover in burned areas that could result in increased sediment loading into waterways. The NPUPL Proposed Action (construction of components of the NERF) in combination with NERF operation would have a beneficial effect on anticipated changes

related to water temperature and water quality in the East Branch Russian River and a neutral effect on the Eel River water temperature and water quality.

Fish and Aquatic Resources

The NPUPL Proposed Action (Section 2.2.2) includes environmental measures to protect fish and aquatic resources during construction (Construction Aquatic Species Management and Monitoring Plan, General Wildlife Measures, Riparian and Wetland Protection Measures, Construction Site Dewatering Plan, and water quality measures discussed above). Placement of fill for NERF construction may have an adverse effect on critical habitat and essential fish habitat for Chinook salmon and steelhead species listed as threatened under the Endangered Species Act (ESA) and habitat for other special-status species (foothill yellow-legged frog [FYLF], northwestern pond turtle, lamprey spp., and western pearlshell mussels) and native species (e.g., Sacramento sucker) within Van Arsdale Reservoir. The effect is small due to the size of the fill area (0.86 acre) and the existing low quality of the habitat. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in negligible to beneficial cumulative effects to fish and aquatic resources.

- PG&E's decommissioning and removal of Scott Dam and Cape Horn Dam would restore fish passage for ESA-listed Chinook salmon and steelhead, other special-status species, and native species into the Eel River Watershed headwaters (50+ miles of spawning and rearing habitat). Removal of Cape Horn Dam would provide anadromous fish unconstrained passage to the mainstem upper Eel River and tributaries. Removal of Cape Horn Dam, however, would stop water diversions into the East Branch Russian River. This would result in the long-term direct loss of special-status species (FYLF, northwestern pond turtle, western pearlshell mussels) (see Section 3.4.1.4). PG&E's removal of Cape Horn Dam and ERPA's construction of components of the NERF (NPUPL Proposed Action) would occur at the same time. PG&E's decommissioning would have a neutral cumulative effect on the NPUPL Proposed Action (construction of components of the NERF) related to fish and aquatic species; however, construction of the NERF would facilitate water diversions to the East Branch Russian River (see Water Use and Hydrology above), and this, along with protection of Eel River flows, would have a long-term cumulative beneficial effect on special-status species (FYLF, northwestern pond turtle, western pearlshell mussels).
- Operation of the NERF would allow continued diversion of Eel River water to the East Branch Russian River following removal of Cape Horn Dam and Lake Pillsbury storage. The timing and monthly volume of water diverted would be altered compared to existing conditions (Table 3.4.2-1). The NERF diversions would depend on seasonal water availability of the unimpaired Eel River flows and maintaining protection of flow in the Eel River below the NERF facility. The proposed total NERF diversions would more closely resemble the pattern of a natural hydrograph compared to the existing condition. Average monthly diversions in the drier months of July through October would be low, 1 cfs to 6 cfs, and in the wetter months of December through April would increase up to

approximately 55 cfs to 120 cfs, depending on the upper or lower limit scenario (Table 3.4.2-1). The low summer diversion would provide limited direct surface flow to the East Branch Russian River, but it is anticipated that the earlier season flows would help maintain groundwater levels and result in some level of groundwater inflow to the East Branch Russian River in the summer/fall. In combination with the NPUPL Proposed Action, the NERF diversions and protection of flows on the Eel River would have a cumulative beneficial effect on special-status species (FYLF, northwestern pond turtle, western pearlshell mussels) in the East Branch Russian River and a neutral cumulative effect on fish and aquatic resources in the Eel River.

- The overarching goal of the Eel River Restoration and Conservation Plan is to build on existing restoration actions in the watershed, including the removal of Scott and Cape Horn dams. The restoration and conservation program is intended to protect federally protected fish species in the Eel River Watershed and aid in their recovery with a focus on fall-run Chinook salmon, coho salmon, steelhead (summer and winter run), Pacific lamprey, and green sturgeon (Cal Trout *et al.* 2024). Implementation of the Eel River Restoration and Conservation Plan, the NPUPL Proposed Action (construction of components of the NERF), NERF diversions, and protection of Eel River flows would result in beneficial cumulative effect on fish and aquatic resources.
- Development and implementation of TMDLs in the watershed would potentially improve habitat conditions in the Eel and East Branch Russian rivers. Implementation of the TMDLs in combination with the NPUPL Proposed Action would result in a beneficial cumulative effect on fish and aquatic resources.
- Recovery actions in the Coastal Multispecies Recovery Plan for federally protected Chinook salmon and steelhead include reducing threats to habitat, abating disease and predation, and addressing regulatory mechanism for protecting the species. The recovery plan is intended to provide a framework for the conservation and survival of these species. Implementation of the NPUPL Proposed Action and the Coastal Multispecies Recovery Plan would result in a beneficial cumulative effect on fish and aquatic resources.
- The Potter Valley Tribe’s acquisition of approximately 879 acres of forested lands in the Eel River Watershed (Trout Creek and Alder Creek land acquisition) would include developing recreational facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, and managing wildfire and fuels. These activities in combination with the NPUPL Proposed Action would result in beneficial cumulative effects to fish and aquatic resources.
- Climate change could alter the historical timing, magnitude, and quality of flows in Eel River Watershed, increase water temperatures, and, in the case of fire, reduce vegetation cover in burned areas that could result in increased sediment loading into waterways. The NPUPL Proposed Action (construction of components of the NERF) in combination with NERF operation would have a beneficial effect on the anticipated changes to water temperature and fish and aquatic resources in the East Branch Russian River and a neutral effect on the Eel River.

Botanical Resources

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in negligible to beneficial cumulative effects to botanical resources (botanical, riparian, and wetland resources).

- The NPUPL Proposed Action includes construction activities within the ordinary high-water mark (OHWM) of the Eel River. Operation of the NERF will require additional construction activities to be implemented (above the OHWM) in combination with the NPUPL Proposed Action. This could result in additional construction-related effects such as disturbance to special-status plant individuals, introduction of invasive weeds, or effects to riparian and wetland habitat from erosion and sedimentation. Final construction activities and long-term operation of the NERF will require project-specific permits and approvals and implementation of avoidance and protection measures to protect environmental resources. Considering that these construction activities would take place in the immediate vicinity of the NPUPL Proposed Action and would affect a relatively small area along the bank of the Eel River, with implementation of environmental measures, cumulative effects to botanical resources, including riparian and wetland habitats, would be considered negligible.
- The Potter Valley Tribe acquired approximately 879 acres of forested lands in the Eel River Watershed under the Eel River – Trout Creek and Alder Creek land acquisition. Long-term plans under this acquisition that could cumulatively affect botanical resources (special-status plants, riparian and wetland habitats) include developing recreation facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, and managing wildfire and fuels. The cumulative impact on botanical resources depends on the exact nature of the activities. Construction of additional recreational facilities could increase human disturbance pressure or alter habitats for special-status plants. Expanding environmental education programs may help protect sensitive botanical resources and promote conservation activities. Wildfire and fuels management may reduce stand-replacing fire risks, which could benefit special-status plant species that depend on forested habitats. Therefore, in combination with the NPUPL Proposed Action, this land acquisition would likely result in neutral to beneficial cumulative effects to botanical resources, including riparian and wetland habitats.

Wildlife Resources

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in negligible to beneficial cumulative effects to wildlife resources (including threatened and endangered species).

- The NPUPL Proposed Action includes construction activities within the OHWM of the Eel River. Operation of the NERF will require additional construction activities to be implemented (above the OHWM) in combination with the NPUPL Proposed Action. This could result in additional construction-related effects such as disturbance to wildlife resources, modification of habitats through the introduction of invasive weeds, and/or effects to riparian and wetland habitats from erosion and sedimentation. Final construction activities and long-term operation of the NERF will require project-specific permits and approvals and implementation of avoidance and protection measures to protect environmental resources. Considering that these construction activities would take place in the immediate vicinity of the NPUPL Proposed Action and would affect a relatively small area along the bank of the Eel River, with implementation of environmental measures, cumulative effects to wildlife resources would be considered negligible.

- Implementation of the fisheries restoration plans and projects identified in the Eel River Restoration and Conservation Plan would protect federally listed fish species within the watershed and aid in the recovery of anadromous fish populations. Additionally, implementation of recovery actions under NOAA's Coastal Multispecies Recovery Plan would address current population threats for listed species and restoration of spawning habitats within the Eel River Watershed, with the goal of enhancing self-sustaining and naturally spawning steelhead and salmon populations. Because construction activities would take place within one construction season, the NPUPL Proposed Action would have negligible effects on fish prey resources for fish-eating wildlife such as bald eagle and osprey. Implementation of the Eel River Restoration and Conservation Plan and NOAA's Coastal Multispecies Recovery Plan would result in beneficial, long-term cumulative effects on wildlife resources within the Eel River Watershed.
- The Potter Valley Tribe acquired approximately 879 acres of forested lands in the Eel River Watershed under the Eel River – Trout Creek and Alder Creek land acquisition. Long-term plans under this acquisition that could cumulatively affect wildlife resources include developing recreation facilities, expanding environmental education programs, assisting with restoration of habitat and fishery resources, and managing wildfire and fuels. The cumulative impact on wildlife depends on the exact nature of the activities. Construction of additional recreational facilities could increase human disturbance pressure or alter wildlife habitats. Expanding environmental education programs may help protect sensitive wildlife resources and promote conservation activities. Restoration of fisheries may enhance foraging opportunities for fish-eating wildlife such as bald eagle and osprey. Wildfire and fuels management may reduce stand-replacing fire risks, which could benefit closed canopy forest species such as northern spotted owl, fisher, and marten. Therefore, in combination with the NPUPL Proposed Action, this land acquisition would likely result in neutral to beneficial cumulative effects to wildlife resources.

Geomorphology

NPUPL Proposed Action construction of components of the NERF includes environmental measures to protect geomorphology during construction (construction-related BMPs, Erosion Prevention Plan, SWPPP, NERF Engineering Design Report). Placement of fill and construction of a retaining wall for the NERF may have an adverse effect on about 290 feet of the Eel River channel. ERPA would obtain permits and adhere to any required compensatory mitigation measures included in these permits.

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in negligible to beneficial cumulative effects to geomorphic processes and form.

- PG&E decommissioning would remove Scott and Cape Horn dams and restore unimpaired hydrology and sediment supply/transport in the Eel River. Geomorphic processes would improve in the Eel River below Scott Dam (e.g., sediment supply). Diversions from the Eel River to the East Branch Russian River would cease. In the East Branch Russian River, summer flows would be much lower than existing conditions but high-flow events would still occur seasonally because of storm events. In response to the high-flow events, the East Branch Russian River channel would adjust in geomorphic form to a condition more similar to its unimpaired, natural condition prior to receiving increased flows from Eel River diversions. With construction of the NERF (NPUPL Proposed Action) and diversion of Eel River water to the East Branch Russian River while protecting flows in the Eel River (see below), there would be a long-term cumulative benefit to geomorphic processes in the East Branch Russian River and a neutral cumulative effect in the Eel River (see below).
- The NPUPL Proposed Action (Section 2.2.2) includes specific construction activities within the Eel River. The lands and project works necessary for the NERF would be removed from the Potter Valley Hydroelectric Project (Project) boundary and Federal Energy Regulatory Commission (FERC) jurisdiction immediately after the following actions are completed: (1) PG&E has completed decommissioning work at Cape Horn Dam and other Project works associated with the NERF, (2) the NERF has been constructed, and (3) PG&E has filed a completion report with FERC on these actions. Following the transfer of the lands and Project works, construction of other components of the NERF (infrastructure building, pumps, parking, access road) will be required. There is limited potential for this construction to result in additional construction-related effects such as erosion and sediment delivery to the Eel River that could affect channel geomorphology. Final construction activities and long-term operation of the NERF will require project-specific permits and approvals (e.g., BMPs designed to minimize and control soil erosion and sedimentation) and approvals to divert flows (e.g., biological opinion). The NPUPL Proposed Action (construction of components of the NERF construction) and NERF diversions in combination with PG&E's decommissioning of Cape Horn Dam would have a long-term cumulative benefit to geomorphic processes in the East Branch Russian River and have a neutral cumulative effect on geomorphic processes and form in the Eel River.
- The Eel River Restoration and Conservation Plan; implementation of TMDLs in the Eel River and East Branch Russian River watersheds; implementation of the Coastal Multispecies Recovery Plan; and the Potter Valley Tribe's Trout Creek and Alder Creek land acquisition all include some measure of watershed management. These activities would reduce erosion and sedimentation and benefit hydrology (e.g., groundwater recharge, regulate runoff). In combination with the NPUPL Proposed Action, there would be a long-term cumulative beneficial effect to geomorphology.

- Climate change is predicted to lead to more frequent and intense storms that could increase the magnitude, but also decrease the duration, of peak flows for the flood events that create geomorphic change. Removal of Scott Dam and loss of runoff storage at Lake Pillsbury will restore unimpaired hydrology. For example, it is predicted that the 2-year recurrence interval event would increase by 38 percent, from 7,420 cfs to 10,242 cfs, at Scott Dam (see Table 3.3.1-8 in Section 3.3.1). The differences would be smaller for less frequently occurring flood events and with increasing distance downstream in the Eel River Watershed as other tributaries contribute flow. The unimpaired hydrology, combined with climate change, could lead to increased frequency of sediment mobilization, deposition or erosion of channel bars and banks, and resetting of riparian vegetation. These are natural processes. The cumulative effect of climate change and the NPUPL Proposed Action is expected to be neutral to natural geomorphic processes.

Cultural Resources

The other actions listed in Section 3.5.2.4 in combination with the NPUPL Proposed Action would result in an overall adverse cumulative effect to cultural resources. Because significant cultural resources are unique and non-renewable members of finite classes, all adverse effects erode a dwindling resource base. The loss of any one cultural resource could affect the scientific value of others in a region because these resources are best understood in the context of the entirety of the cultural system of which they are a part.

Archaeological Sites

Implementation of other actions listed in Section 3.5.2.4 and the NPUPL Proposed Action would result in cumulative adverse effects to archaeological sites. Physical damage to known and unknown archaeological sites could occur through construction-related ground disturbance. In addition, the transfer, lease, or sale of historic property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance could result in adverse effects to archaeological sites.

Built Environment

Implementation of other actions listed in Section 3.5.2.4 and the NPUPL Proposed Action would result in cumulative adverse effects on built-environment resources. No resource-specific studies have been conducted to help identify the specific effects to built-environment cultural resources. However, given the absence of information, it is assumed the construction of the new pump station and alterations to the existing hydroelectric facility would have adverse effects on built-environment cultural resources that may be eligible for listing in the National Register of Historic Places. The transfer, lease, or sale of historic property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance could result in adverse effects to built-environment cultural resources. In addition, other project actions could result in changes to the character, use, or physical setting of built-environment resources that contribute to the resource's historic significance.

Tribal Resources

The NPUPL Proposed Action, along with other actions listed in Section 3.5.2.4 , would result in an overall cumulative benefit to Tribal resources, especially restoration of native fisheries (see Fish and Aquatics section above), other ethnobiological resources (see Botanical and Wildlife Resources sections above), and water quality. Implementation of restoration plans, the fisheries restoration plans, projects identified in the Eel River Restoration and Conservation Plan, and recovery actions under NOAA's Coastal Multispecies Recovery Plan if developed in consultation with Tribes would result in benefits to water quality, aquatic resources, fisheries, and terrestrial resources used by all Tribes. These benefits would aid in the continuation and restoration of Tribal practices and traditions that have been adversely affected by the creation of the hydroelectric project and dams on the Eel River.

Ground disturbance from the NPUPL Proposed Action coupled with other actions that are expected to occur in the future may cause cumulative adverse effects to parts of known and unknown archaeological sites and other non-renewable Tribal resources including human remains. The cumulative loss of non-renewable Tribal resources could diminish the religious and cultural significance of the resource by changing the contributing elements, character, use, or physical and sensory setting of Traditional Cultural Places, Traditional Cultural Landscapes, and other significant Tribal resources.

3.5.2.6 Cumulative Effects on Climate Change

Global climate change refers to an increase in the average temperature of the Earth's atmosphere and oceans, and its projected continuation. The causes of global change have been linked to both natural processes and human actions. According to the Intergovernmental Panel on Climate Change (IPCC), increasing greenhouse gas (GHG) concentrations resulting from human activity, such as fossil fuel combustion and deforestation without adequate revegetation, have been largely responsible for human-induced global warming (IPCC 2023). Increases in the concentrations of GHGs in the atmosphere decrease the amount of solar radiation reflected back into space, intensifying the natural "greenhouse effect" and resulting in the increase of global average temperatures. The most common GHGs include carbon dioxide and water vapor, although there are several others, such as methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The potential heat trapping ability of each of the GHGs varies substantially. To account for these differences in warming effect, GHGs are defined by their global warming potential. In this analysis, GHGs are reported as carbon dioxide equivalents to measure their relative potency.

GHG impacts are inherently cumulative, and all GHG emissions contribute to the significant environmental impacts of global climate change. Although an individual project cannot generate enough GHG emissions to change climactic conditions, the combination of GHG emissions from an individual project in combination with other future projects could contribute to global climate change. This analysis focuses on the potential incremental contribution of the NPUPL Proposed Action in combination with past and current projects and reasonably foreseeable future projects on GHG emissions within California.

The geographic scope of this cumulative GHG analysis is the State of California because the state is the controlling legal authority on GHG emissions in the project area. The most recent statewide climate change legislation is Assembly Bill (AB) 1279, The California Climate Crisis Act, which establishes the policy of the state to achieve carbon neutrality as soon as possible, but no later than 2045, and maintain net negative GHG emissions thereafter. The following discussion considers how the NPUPL Proposed Action in combination with other cumulative projects within the state may affect achievement of the goals established in AB 1279.

Construction of the NERF would result in GHG emissions from the combustion of petroleum fuels to power on-road vehicles and off-road equipment. However, these construction emissions would be temporary and intermittent and would cease upon completion of work. Although GHG emissions and global climate change are inherently cumulative impacts, the incremental contribution of Project construction emissions in the context of statewide emissions is negligible, and implementation of the Project would not preclude the state from achieving the climate goals established in AB 1279. In conclusion, impacts of the NPUPL Proposed Action on GHG emissions and the resulting effect on global warming, when considering other projects and actions across the state, are negligible.

3.5.2.7 References

Cal Trout *et al.* (California Trout, Stillwater Sciences, Applied River Sciences, and UC Berkeley). 2024. Eel River restoration and conservation plan—Phase 1: planning—of the Eel River watershed restoration and conservation program. Prepared for California Department of Fish and Wildlife. June 2024.

IPCC (Intergovernmental Panel on Climate Change). 2023. Climate change 2023 synthesis report; summary for policymakers. Available at: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf. Accessed January 2025.

NOAA (National Oceanic and Atmospheric Administration). 2016. Coastal multispecies recovery plan. Available at: https://www.fisheries.noaa.gov/resource/document/final-coastal-multispecies-recovery-plan-california-coastal-chinook-salmon. Accessed January 2025.

U.S. Environmental Protection Agency. 2004. Upper main Eel River and tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury) total maximum daily loads for sediment and temperature. Prepared by U.S. Environmental Protection Agency, Region IX, San Francisco, CA.

U.S. Environmental Protection Agency. 2005. Final middle main Eel River and tributaries (from Dos Rios to the South Fork) total maximum daily loads for temperature and sediment. U.S. Environmental Protection Agency Region IX, San Francisco, CA.

U.S. Environmental Protection Agency. 2007. Lower Eel River total maximum daily loads for temperature and sediment. U.S. Environmental Protection Agency Region IX, San Francisco, CA.

TABLE OF CONTENTS

List of Tables

This Page Intentionally Left Blank

4.0 LIST OF PREPARERS

This section provides the names and titles of PG&E personnel that prepared and provided review of the Project Application for New License, including Exhibit E (Table 4-1). In addition, a complete list of preparers is provided in Table 4-2 that includes the firm, personnel name, current position, highest degree received, the field in which the degree was received, and section(s) prepared.

Table 4-1. PG&E preparers and reviewers.

Staff	Title (technical area, if applicable)
Senior Management Review	
Tony Gigliotti	Sr. Licensing Project Manager
Lisa Whitman	Relicensing Supervisor, Hydro Licensing
Janet Walther	Hydro Licensing & Compliance Director
Legal Review	
Kim Ognisty	Senior Counsel
Charles Sensiba (Troutman Pepper)	Strategic Advisor
Technical Review	
Jesus Viscarra	Principal Land Planner
Anne-Marie Cannon	Sr. Land Planner
Andrew Anderson	Sr. Aquatic Biologist (Biology)
Shannon Johnson	Sr. Consulting Scientist (Biology)
Ed Cheslak	Manager, Environmental Management—Generation Projects (Hydrology and Water Resources Management)
Michelle Lent	Hydro Scheduler (Hydrology and Water Resources Management)
Christophe Descantes	Sr. Cultural Resources Specialist (Cultural Resources)
Daren Dalrymple	Senior Public Safety Specialist (Land Use)
Rodel Gravador	Asset Management Engineer (Traffic)
David Ivakhov	Project Engineer (Traffic)
Rohit Salve	Senior Consulting Scientist (Hydrology, Geomorphology & Water Quality)
Brian Williamshen	Senior Water Quality Scientist (Water quality, Geomorphology and Geology)

This Page Intentionally Left Blank

Table 4-2. Consultant team preparers – surrender application and non-project use of project lands application.

Staff	Title	Degree	Major	Company	Senior Management and Review	Strategic Support	Technical Review	Project Coordination	Production	GIS/Graphics	Introduction	Proposed Action and Alternatives	Environmental Analysis Approach	Description of the River Basin	Water Use and Hydrology	Water Quality	Fisheries and Aquatic Life	Botanical	Wildlife	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetics	Cultural Resources	Tribal Resources	Socioeconomics	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources	Cumulative Effects	List of Preparers
Project and Application Leads																																		
Katie Ross-Smith	Project Manager; Sr. Principal Ecologist	PhD	Environmental Sciences	Stantec	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Michael Manwaring	Regional Sector Leader	MS	Geology	Stantec	●	●	●																											
Coralie Allen	Deputy Project Manager; Sr. Project Scientist	MS	Environmental Economics	Stantec	●			●	●																									
Alison Uno	Sr. Consultant	MS	Sustainable Environmental Management	Stantec	●		●	●	●			●	●	●								●	●	●			●	●	●	●	●		●	
Sandra Walter-Perry	Sr. Project Scientist	BA	Geological Sciences	Stantec	●		●	●						●						●		●	●	●				●	●					
Craig Addley	Sr. Science Consultant	PhD	Civil and Environmental Engineering	Kleinschmidt Group		●	●						●		●	●	●				●											●		
Janelle Nolan	Principal	BS	Wildlife and Fisheries Biology	JNA Consulting		●	●					●	●					●	●														●	
Production Team																																		
Malini Roberts	Sr. Technical Editor	MS	English / Publishing	Stantec			●																											
Dani Putney	Sr. Technical Editor	PhD	English	Stantec			●																											
Iris Eschen	Production Manager	Cert	Office Administration	Stantec					●																									
Technical Staff																																		
Alisa Reynolds	Sr. Principal Archaeologist	MA	Anthropology	Stantec																					●	●								
Andrea Ahrens	Principal Marine Biologist	MSc	Marine Biology	Stantec																												●		
Barbara Wyse	Principal and Sr. Economist	MS	Environmental and Natural Resource Economics	Highland Economics																							●							
Blair Greimann	Principal Hydraulic Engineer	PhD	Civil Engineering	Stantec											●						●													

Staff	Title	Degree	Major	Company	Senior Management and Review	Strategic Support	Technical Review	Project Coordination	Production	GIS/Graphics	Introduction	Proposed Action and Alternatives	Environmental Analysis Approach	Description of the River Basin	Water Use and Hydrology	Water Quality	Fisheries and Aquatic Life	Botanical	Wildlife	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetics	Cultural Resources	Tribal Resources	Socioeconomics	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources	Cumulative Effects	List of Preparers
Brendan Belby	Principal Scientist	MS	Geography	Stantec																	●													
Briette Shea	Air Quality Specialist	BS	Environmental Sciences	Stantec				●																●				●	●	●	●			●
Caroline Hamilton	Environmental Scientist	BA	Environmental Science and Policy	Stantec													●																	
Crystal West	Sr. Cultural Specialist	BA	Anthropology / Archaeology	Stantec																					●	●								
Eric Lee	Sr. GIS Analyst	BA	English / Geography	Stantec						●																								
Jared Emery	Sr. Engineer	BS	Physics	Western Hydrologics											●																			
Jeff Meyer	Principal	BS	Civil Engineering	Western Hydrologics											●																			
Jesse Wechsler	Sr. Fish and Aquatic Scientist	MA	Geography	Stantec													●																	
Julia Beals	Environmental Planner	BA	Environmental Earth Science	Stantec												●																		
Julie Smith	Principal	BA	Environmental Studies & Geography	Stantec		●																												
Katie Bonham	Associate Archaeologist	BA	Anthropology	Stantec																					●	●								
Kendra Ryan	Principal Environmental Planner	BS	Landscape Architecture	Stantec																										●	●			
Kevin Gabel	Associate GIS Analyst	BS	Geography	Stantec						●																								
Laura Casali	Marine Scientist	MSc	Environment & Natural Resource Science	Stantec																												●		
Lora Holland	Sr. Associate Archaeologist	MA	Anthropology / Archaeology	Stantec																					●	●								
Marca Hagenstad	Sr. Principal	MS	Economics	Stantec																		●	●											

Staff	Title	Degree	Major	Company	Senior Management and Review	Strategic Support	Technical Review	Project Coordination	Production	GIS/Graphics	Introduction	Proposed Action and Alternatives	Environmental Analysis Approach	Description of the River Basin	Water Use and Hydrology	Water Quality	Fisheries and Aquatic Life	Botanical	Wildlife	Geology and Soils	Geomorphology	Land Use	Recreation Resources	Aesthetics	Cultural Resources	Tribal Resources	Socioeconomics	Environmental Justice	Air Quality	Noise	Traffic	Marine Resources	Cumulative Effects	List of Preparers
Miranda Taylor	Environmental Planner	BS	Environmental Science and Management	Stantec													•																	
Paul Stoppelman	Principal Geologist	MS	Geology	Stantec																•														
Robyn Smith	Project Scientist II	MS	Ecology	JNA Consulting														•	•														•	
Sara Reece	Principal	BS	Wildlife, Fisheries, and Conservation Biology	JNA Consulting														•	•														•	
Sarah Kassem	Sr. Coastal Engineer	MS	Civil Engineering	Stantec																												•		
Vanessa Martinez	Sr. Engineer	MS	Civil and Environmental Engineering	Kleinschmidt Group												•																		

This Page Intentionally Left Blank