UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Pacific Gas and Electric Company, California Project No. 803-087

NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL ASSESSMENT

(July 24, 2009)

In accordance with the National Environmental Policy Act of 1969 and Federal Energy Regulatory Commission (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47879), the Office of Energy Projects has reviewed the application for a new license for the DeSabla-Centerville Hydroelectric Project (project), located on Butte Creek in Butte County, California, and has prepared a final environmental assessment (final EA). In the final EA, Commission staff analyze the potential environmental effects of relicensing the project and conclude that issuing a new license for the project, with appropriate environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

A copy of the final EA is on file with the Commission and is available for public inspection. The final EA may also be viewed on the Commission's website at http://www.ferc.gov using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at 1-866-208-3676, or for TTY, (202) 502-8659.

Kimberly D. Bose,
Secretary.

# FINAL ENVIRONMENTAL ASSESSMENT

# FOR

# NEW MAJOR HYDROPOWER LICENSE

DeSabla-Centerville Hydroelectric Project

FERC Project No. 803-087

California

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

July 2009

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADA | Americans with Disabilities Act |
| APE | area of potential effects |
| Basin Plan | California Regional Water Quality Control Board' Water Quality Plan for the Central Valley Region |
| BLM | U.S. Bureau of Land Management |
| °C | degrees Celsius |
| Cal Fish & Game | California Department of Fish and Game |
| CA/MX | California-Mexico Power Area |
| CEQA | California Environmental Quality Act |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CNPS | California Native Plants Society |
| Commission | Federal Energy Regulatory Commission |
| CSSA | California Salmon and Steelhead Association |
| DO | dissolved oxygen |
| DWR | Department of Water Resources (California) |
| EA | environmental assessment |
| EFH | essential fish habitat |
| EIR | environmental impact report |
| EIS | environmental impact statement |
| El. | elevation |
| EPA | U.S. Environmental Protection Agency |
| EPAct | Energy Policy Act of 2005 |
| ESA | Endangered Species Act |
| ESU | evolutionarily significant unit |
| FERC | Federal Energy Regulatory Commission |
| Forest Service | U.S. Forest Service |
| FPA | Federal Power Act |
| FWS | U.S. Fish and Wildlife Service |
| GWh | gigawatt-hour |
| HPMP | Historic Properties Management Plan |
| IFIM | instream flow incremental methodology |
| ILP | Integrated Licensing Process |
| Interior | U.S. Department of the Interior |
| kWh | kilowatt-hour |
| Magnuson-Stevens Act | Magnuson-Stevens Fishery Conservation and Management Act |
| msl | mean sea level |
| MW | megawatt |
| MYLF | mountain yellow-legged frog |
| National Register | National Register of Historic Places |

| | |
|---|---|
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| OHV | off-highway vehicle |
| PA | programmatic agreement |
| PG&E | Pacific Gas and Electric Company |
| RM | river mile |
| SHPO | State Historic Preservation Officer (California) |
| SPI | Sierra Pacific Industries |
| USGS | U.S. Geological Survey |
| VELB | valley elderberry longhorn beetle |
| Water Board | California Water Resources Control Board |
| WMMT | weekly mean of the daily maximum temperature |
| WQC | water quality certification |
| WUA | weighted useable area |

# EXECUTIVE SUMMARY

On October 2, 2007, the Pacific Gas and Electric Company (PG&E or licensee) filed an application for a new major license for its DeSabla-Centerville Hydroelectric Project, Project No. 803 (project). The 26.7 megawatt (MW) project is located on Butte Creek and the West Branch Feather River in Butte County, California, and consists of three developments (Toadtown, DeSabla, and Centerville), which collectively include three reservoirs, three powerhouses, 14 diversion and feeder dams, five canals, and associated equipment and transmission facilities. The project is described in more detail in section 2.1.1, *Existing Project Facilities*. The project occupies a total of 168.8 acres of federal land under the jurisdiction of the U.S. Forest Service (Forest Service) (147.8 acres) and the U.S. Bureau of Land Management (BLM) (21 acres).[1]

## Proposed Action

PG&E's proposed changes to existing operations include higher minimum instream flow releases at three locations:

- West Branch Feather River below Hendricks diversion dam
- Butte Creek below Butte Creek diversion dam
- Butte Creek below Lower Centerville diversion dam

PG&E proposes to construct a water temperature improvement facility within the DeSabla forebay to reduce the thermal loading effects of the forebay on water discharged to Butte Creek and to rehabilitate and upgrade existing recreation facilities. Additional measures PG&E proposes include: removal of five feeder diversions; monitoring the anadromous fishery in lower Butte Creek; protection of Forest Service special status species; invasive species control on Forest Service lands; funding to stock DeSabla forebay with catchable trout and maintain all project roads; implementing a visual, fire management, and hazardous substance land management plan; and implementing a Historic Properties Management Plan. PG&E's measures are described in more detail in section 2.2, *Applicant's Proposal*.

[1] In its license application PG&E states that the DeSabla-Centerville Project occupies 11.6 acres of federal lands administered by BLM. In a letter dated September 10, 2008, BLM indicates that the project occupies an additional 9.4 acres of land administered by BLM.

## Alternatives Considered

This final environmental assessment (final EA) analyzes the effects of the proposed action and recommends conditions for any license issued. In addition to the proposed action, this final EA considers: (1) PG&E's proposal with additional staff-recommended measures (staff alternative); (2) the staff alternative with mandatory conditions; and (3) a no-action alternative.

Under the staff alternative, the project would include most of PG&E's proposed measures, be operated to maintain existing minimum instream flows in the West Branch Feather River, include the agency-recommended instream flows released from the Butte Creek diversion dam, and provide PG&E's proposed minimum instream flows released from the feeder creeks and Lower Centerville diversions. The staff alternative also includes the following additional measures: (1) monitor fish populations and water temperatures in project-affected stream reaches; (2) provide velocity-based ramping rates for project bypassed reaches; (3) provide a 1 cubic feet per second minimum instream flow in Helltown Ravine downstream of the Lower Centerville canal; (4) stabilize the Philbrook spillway channel; (5) extend the boat launch at Philbrook reservoir; and (6) mitigate for the thermal loading of the DeSabla forebay on water discharged to Butte Creek. We include most, but not all, of the section 4(e) measures specified by the Forest Service[2] and BLM in the staff alternative. Measures not included in the staff alternative include BLM's condition 19 to fund law enforcement and the Forest Service's condition 18 for minimum instream flows and condition 19 to monitor West Branch Feather River rainbow trout.[3]

## Public Involvement and Areas of Concern

PG&E utilized the Commission's Integrated Licensing Process (ILP) to prepare its license application. The intent of the Commission's pre-filing process under the ILP is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, Tribes, and other interested parties to identify issues and

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[2] While we adopt most of the Forest Service's 4(e) recommendations, we do so as amended by staff and as described in section 5.2, *Comprehensive Development and Recommended Alternative*. However, we recognize that any 4(e) condition that meets the requirements of the law must be included in any license issued by the Commission, regardless of whether we include or amend the condition in our staff alternative.

[3] However, we note as discussed in section 5.4, that the Forest Service may amend its modified section 4(e) conditions to be consistent with our recommendations that address aquatic resources on the West Branch Feather River and resulting from the 10(j) process (see the Forest Service's letter filed June 11, 2009).

information needs prior to an application being formally filed with the Commission. As part of the pre-filing process, we distributed Scoping Document 1 to interested parties on October 19, 2004, and issued Scoping Document 2 on March 18, 2005. Scoping meetings were held in Chico, California, on November 17 and 18, 2004. On May 1, 2008, after the final license application filing, we requested comments, conditions, and recommendations in our application acceptance and ready for environmental assessment notice. On December 29, 2008, we issued a draft EA for comment. Comments were received in February 2009, and are taken into consideration in this final EA.

**Project Effects**

The table below summarizes the environmental effects of the four alternatives considered in this final EA.

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Generation | 151.5 GWh | 146.2 GWh | 148.79 GWh | 142.47 GWh |
| Geology | Continued erosion along roads and at many project facilities such as Round Valley reservoir spillway and Philbrook spillway channel | Implement best management practices to reduce erosion in project area including roads, Round Valley reservoir spillway, and project canals | The proposed action and the reconstruction areas of the Butte Creek canal, slope, and road, and development and implementation of a Philbrook spillway channel stabilization plan | Same as staff alternative |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Aquatic Resources | Provide existing minimum instream flows, operate project to manage water temperatures in lower Butte Creek for federally listed anadromous fish | Same as no action with higher minimum instream flows for resident fish, remove barriers on five feeder diversions, and conduct fish rescues from project canals | Higher minimum instream flows in Butte Creek, fish screen and ladder at Hendricks diversion dam, monitoring of resident fish populations and water temperatures in project-affected stream reaches, remove barriers on five feeder diversions, and conduct fish rescues from Butte Creek canals | Same as staff alternative with more extensive resident fish monitoring and even higher minimum instream flows on the West Branch Feather River, Butte Creek, and within the feeder creeks |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Terrestrial Resources | Provide and maintain deer protection facilities (bridges, escape structures, etc.) at project canals | Same as no action with protection of special status species and invasive species control on Forest Service lands | Provide velocity-based ramping rates to protect egg masses and tadpoles of the foothill yellow-legged frog, provide monitoring of foothill yellow-legged frog; extend protection of special status species and invasive species control to non-Forest Service lands; bald eagle monitoring; and summary report of animal mortality and additional protection measures, as appropriate | Same as staff alternative with more extensive monitoring of foothill yellow-legged frog |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Threatened and Endangered Species | Operate project to manage water temperatures in lower Butte Creek for federally listed anadromous fish, implement Valley Elderberry Longhorn Beetle Conservation Program | Higher minimum instream flows for federally listed anadromous fish, reduce project effects on water temperature increases at DeSabla forebay, monitor adult Chinook salmon and steelhead in lower Butte Creek, and continue to implement Valley Elderberry Longhorn Beetle Conservation Program | Same as proposed action with additional monitoring of Chinook salmon movements and habitat responses to changes in minimum instream flows | Same as staff alternative |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Recreation Resources | Continue to operate and maintain existing recreation facilities at the project | Same as no action the rehabilitation and upgrades to existing recreation facilities to Americans with Disabilities Act standards, work with the Forest Service to discourage dispersed camping and off-highway vehicle use, install informational signs, fund Cal Fish & Game to stock DeSabla forebay, provide streamflow information and access for whitewater boating | Same as proposed action with additional upgrades to existing boat launch on Philbrook reservoir and existing user-created trail, and recreation monitoring throughout the term of the new license | Same as staff alternative with the addition of a trail on the southeastern shoreline of Philbrook reservoir, a portion of camping fees from Philbrook Campground distributed to the Forest Service, and providing project patrol |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Land Use and Aesthetics | Continue to maintain all project roads and facilities | Work with the Forest Service to identify roads, survey existing road conditions, and maintain all project roads and develop and implement a visual, fire management, and hazardous substance land management plan | Same as proposed action with additional erosion control measures and traffic controls during construction | Same as staff alternative with the addition of a 5-year traffic monitoring plan and road maintenance and/or reconstruction on several non-project roads |
| Cultural Resources | Protect previously identified eligible sites, but no treatment measures for newly identified sites and no policies for avoidance | Historic Properties Management Plan that provides site-specific protection measures and general guidance for protecting cultural sites | Modified Historic Properties Management Plan that includes additional information and collection policies | Same as staff alternative |

**Conclusions**

Based on our analysis, we recommend licensing the project as proposed by PG&E with some staff modifications and additional measures (staff alternative), as described previously under *Alternatives Considered*.

In section 4.1 of the final EA, we estimate the annual net benefits of operating and maintaining the project under the four alternatives identified above. Our analysis shows that the annual net benefit would be $279,000 under PG&E's proposed action and

$5,203,000 under the no-action alternative. For the staff alternative, our analysis shows that the net benefit of the project would be negative (-$1,711,000); and for the staff-recommended alternative with mandatory conditions, our analysis shows that the net benefit of the project would be negative (-$2,640,000).

On the basis of our independent analysis, we conclude that issuing a license for the project as proposed by PG&E with the staff-recommended environmental measures (staff alternative) would not be a major federal action significantly affecting the quality of the human environment.

We chose the staff alternative as the preferred alternative because: (1) it would provide a dependable source of electrical energy for the region (148.79 GWh annually); (2) the 26.7 MW of electric energy generated from a renewable resource may offset the use of fossil-fueled, steam-electric generating plants, thereby conserving nonrenewable energy resources and reducing atmospheric pollution; and (3) the recommended environmental measures proposed by PG&E, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

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**FINAL ENVIRONMENTAL ASSESSMENT**

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

**DeSabla-Centerville Hydroelectric Project**
**FERC Project No. 803-087--California**

# 1.0 INTRODUCTION

## 1.1 APPLICATION

On October 2, 2007, the Pacific Gas and Electric Company (PG&E or licensee) filed an application for a new major license for its existing DeSabla-Centerville Hydroelectric Project, Project No. 803 (project). On November 21 and December 31, 2007, PG&E supplemented its application with the filing of its response to the Federal Energy Regulatory Commission's (Commission or FERC) October 31, 2007, request for additional information, and with its updated study reports, respectively. The 26.7 megawatt (MW) project has historically produced an average annual generation of 151.5 gigawatt-hours (GWh). Located on Butte Creek and the West Branch Feather River in Butte County, California, the project consists of three developments (Toadtown, DeSabla, and Centerville), which collectively include three reservoirs, three powerhouses, 14 diversion and feeder dams, five canals, and associated equipment and transmission facilities (see figures 1-1, 1-2, and 1-3). The project occupies 147.8[4] and 21[5] acres of federal land under the jurisdiction of the U.S. Forest Service (Forest Service) and the U.S. Bureau of Land Management (BLM), respectively, for a total of 168.8 acres of federal lands. PG&E does not propose any new capacity or construction at the project.

[4] The project occupies 145.7 acres of the Lassen National Forest and 2.1 acres of the Plumas National Forest for a total of 147.8 acres of project lands located on National Forest System lands.

[5] In its license application PG&E stated that the project occupies 11.6 acres of federal administered by BLM. In a letter dated September 10, 2008, BLM indicated that the project occupies an additional 9.4 acres of land administered by BLM.

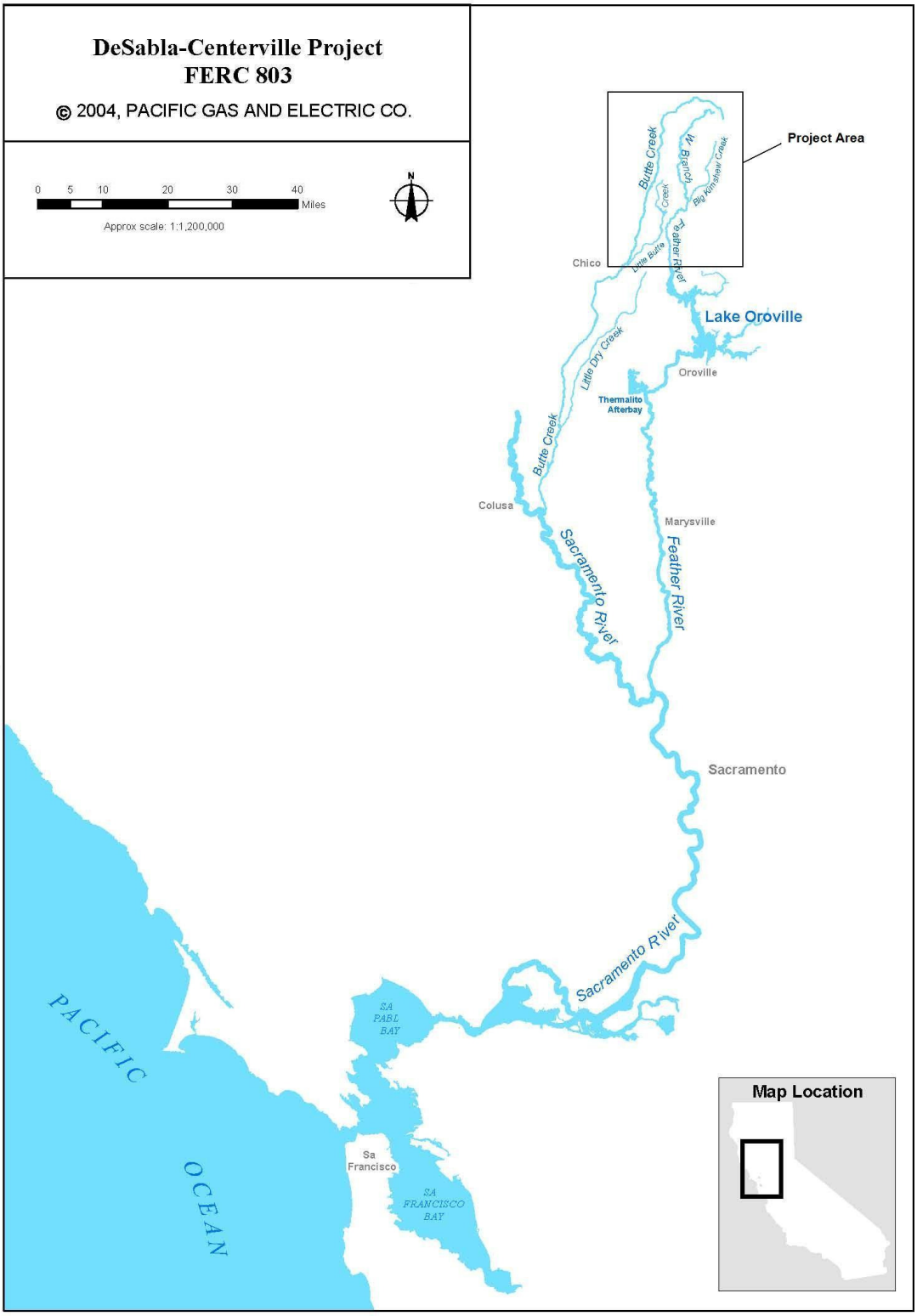
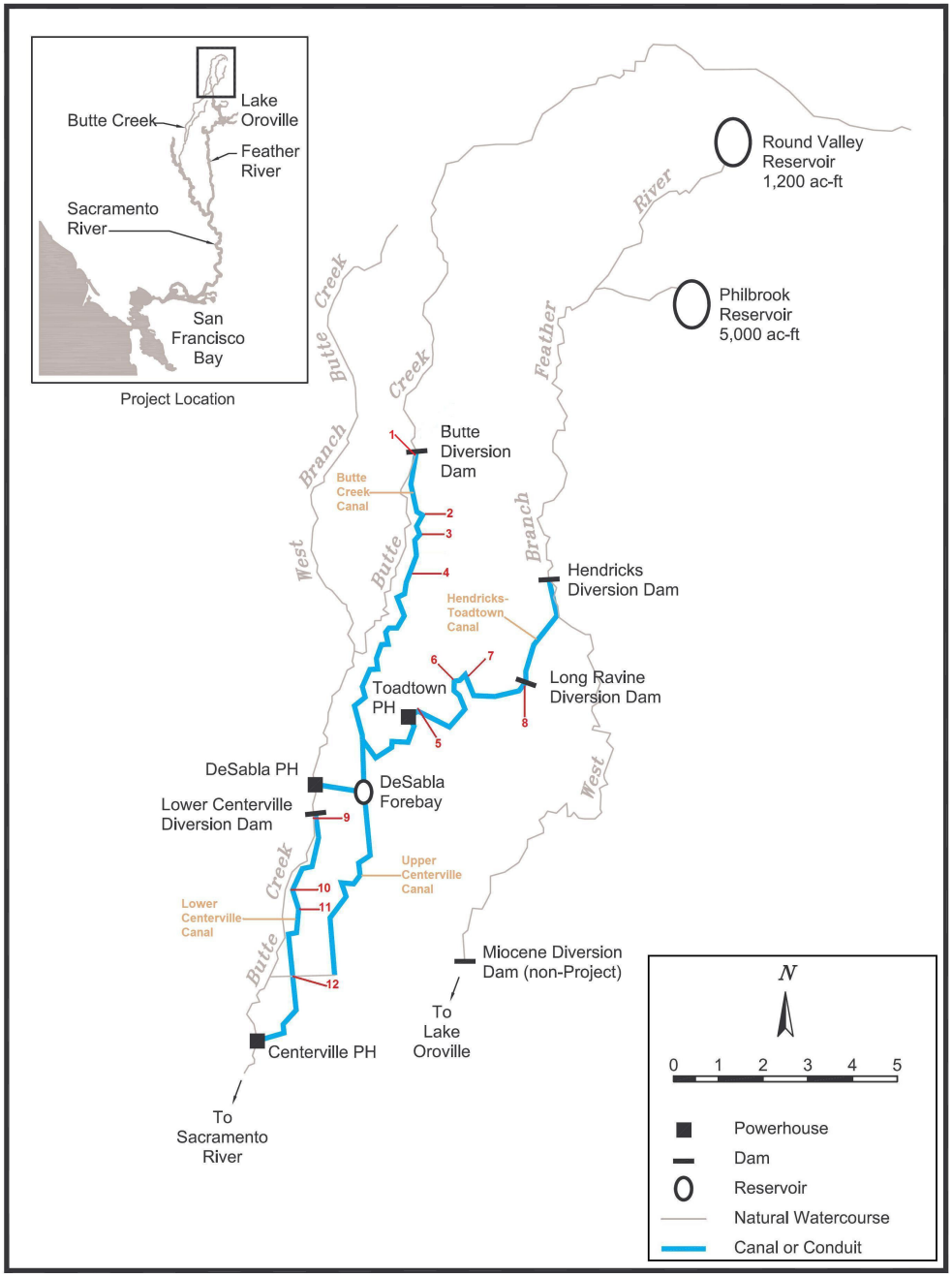



Figure 1-1. Overview map of the Butte Creek and West Branch Feather River drainages. (Source: PG&E, as modified by staff)




Notes: 1-Inskip Creek, 2-Kelsey Creek, 3-Stevens Creek,[6] 4-Clear Creek, 5-Little Butte Creek,[3] 6-Little West Fork, 7-Cunningham Ravine, 8-Long Ravine, 9-Oro Fino Ravine,[3] 10-Emma Ravine,[3] 11-Coal Claim Ravine,[3] 12-Helltown Ravine[7].

Figure 1-2. Locations of major project facilities. (Source: PG&E, as modified by staff)

[6] Diversions from these tributaries have been discontinued.

[7] When in use, flows from Upper Centerville canal are diverted into Helltown Ravine before being delivered to the lower Centerville canal.

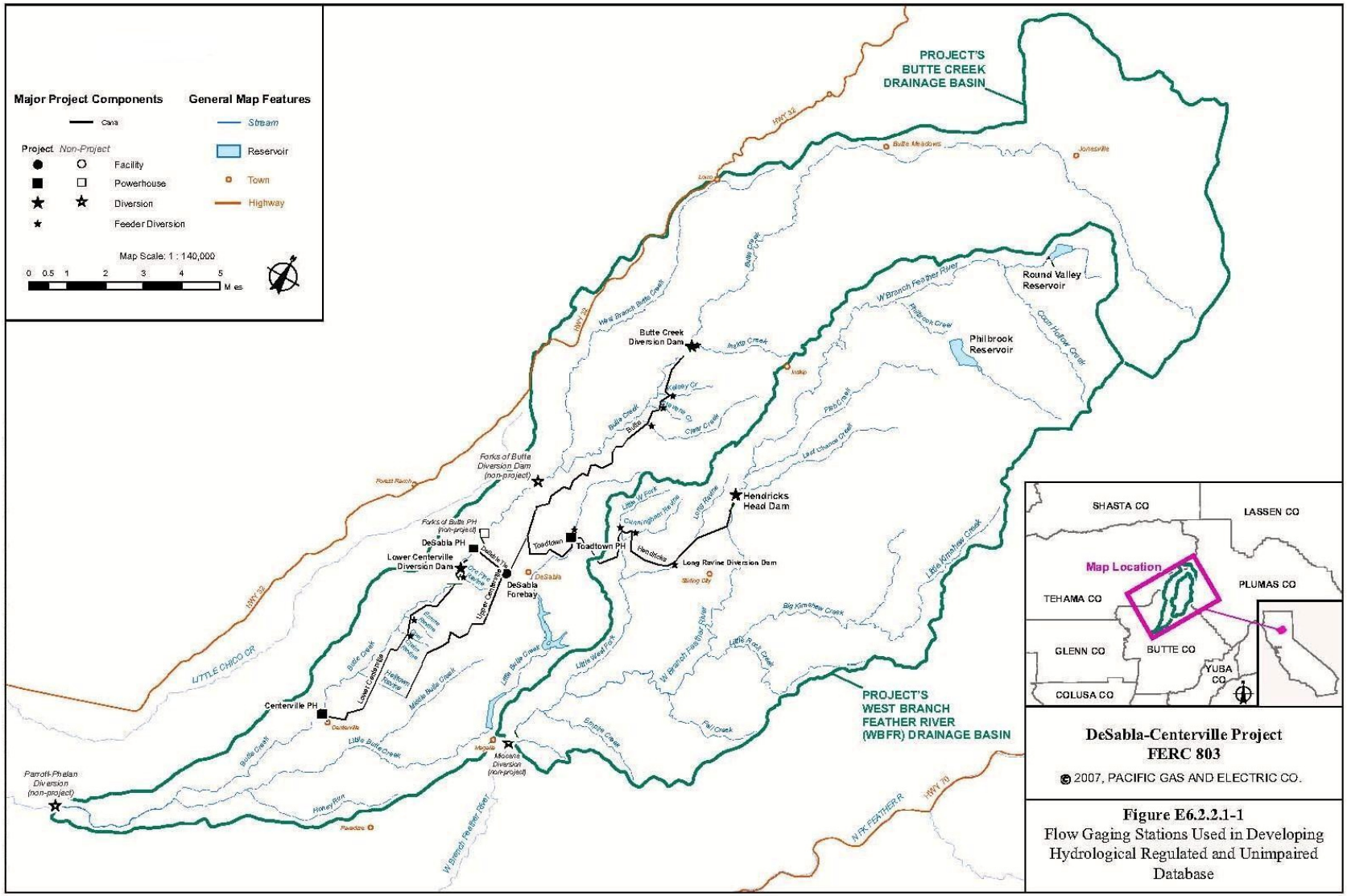



Figure 1-3. Locations of project facilities within project drainage basins. (Source: PG&E, as modified by staff)

## 1.2 PURPOSE OF ACTION AND NEED FOR POWER

### 1.2.1 Purpose of Action

The Commission must decide whether to issue a license to PG&E for the project, and what conditions should be placed in any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of energy conservation; the protection, mitigation of damage to, and enhancements of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

Issuing a new license for the DeSabla-Centerville Hydroelectric Project would allow PG&E to generate electricity at the project for the term of a new license, making electric power from a renewable resource available to its customers.

This final environmental assessment (final EA) assesses the effects associated with operation of the project, alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become a part of any license issued.

In this final EA, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by PG&E; and (2) PG&E's proposal with additional staff-recommended measures (staff alternative); and (3) the staff alternative with mandatory conditions. We also consider the effects of the no-action alternative. Important issues that are addressed include: the establishment of appropriate flow regimes in project-affected stream reaches and water temperature reductions within DeSabla forebay, erosion, ramping rates and monitoring for foothill yellow-legged frogs, recreation, road maintenance/management, and cultural/tribal issues.

### 1.2.2 Need for Power

The DeSabla-Centerville Hydroelectric Project has an installed capacity of 26.7 MW and has historically produced about 151.5 GWh annually with a dependable capacity of 7.9 MW. PG&E will continue to use power from the project to meet the needs of its electric customers. The DeSabla-Centerville Hydroelectric Project is a resource that contributes to PG&E's resource diversity and plays a part in meeting the power requirements of both PG&E and the state of California.

PG&E is an electric and gas utility with a service area that stretches from Eureka, California, in the north to Bakersfield, California, in the south, and from the Pacific

Ocean in the west to the Sierra Nevada in the east. PG&E maintains 123,054 circuit miles of electric distribution lines and 18,610 circuit miles of interconnected transmission lines and provides electric service to about 5.1 million customers. PG&E produces or buys its power from a mix of conventional and renewable resources.

In July 2007, the California Energy Commission released *California Energy Demand 2008-2018, Staff Draft Forecast*.[8] This report shows that, in the PG&E planning area, electricity consumption and peak load is forecast to increase about 1.3 percent per year over the next 10 years.

The DeSabla-Centerville Hydroelectric Project is in the California-Mexico Power Area (CA/MX) of the Western Electricity Coordinating Council within the North American Electric Reliability Council. The Western Electricity Coordinating Council forecasts electrical supply and demand for the region for a 10-year period.[9] According to the July 2006, 10-Year Coordinated Plan Summary, annual capacity requirements are projected to grow at an annual compound rate of 1.9 percent through 2015 for the CA/MX region. Also, the July 2006 10-Year Coordinated Plan Summary projects the annual energy usage to increase at 2.1 percent through 2015 for the CA/MX region.

If licensed, the power from the project would continue to be useful in meeting PG&E's needs as well as part of the local and regional need for power. The project provides low-cost power that displaces non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities may avoid some power plant emissions and creates and environmental benefit.

## 1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the DeSabla-Centerville Hydroelectric Project is subject to requirements under the Federal Power Act (FPA) and other applicable statutes. The major regulatory and statutory requirements are summarized in table 1-1 and described in further detail below.

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[8] California Energy Commission. July 2007. California Energy Demand 2008-2018, Staff Draft Report, CEC-200-2007-015SD.

[9] Western Electricity Coordinating Council. July 2006. 10-Year Coordinated Plan Summary, Planning and Operation for Electric System Reliability.

Table 1-1. Statutory and regulatory requirements for the DeSabla-Centerville Hydroelectric Project. (Source: Staff)

| Requirement | Agency | Status |
|---|---|---|
| Section 18 of the FPA (fishway prescriptions) | FWS, NMFS | FWS and NMFS filed a reservation of authority on June 27, 2008, and June 30, 2008, respectively. |
| Section 4(e) of the FPA (land management conditions) | Forest Service, BLM | Forest Service and BLM provided preliminary 4(e) conditions on June 27, 2008 and September 11, 2008, respectively. The Forest Service also provided modified 4(e) conditions on April 28, 2009. |
| Section 10(j) of the FPA | California Department of Fish and Game, FWS, NMFS | The agencies provided section 10(j) recommendations on July 8, 2008, June 27, 2008, and June 30, 2008, respectively. |
| Clean Water Act—Water Quality Certification | California Water Resources Control Board | Application for certification received on May 29, 2009; due by May 29, 2010. |
| Endangered Species Act | FWS, NMFS | This final EA serves as our revised Biological Assessment under section 7 of the Endangered Species Act.<br>We received FWS concurrence on March 24, 2009.<br>NMFS Biological Opinion is pending. |

### 1.3.1 Federal Power Act

#### 1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require the construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the U.S. Department of the Interior (Interior). Interior, by letter dated June 27, 2008, and the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), by letter dated June 30, 2008, requests that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

#### 1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. On June 27, 2008, and September 11, 2008, the Forest Service and BLM, respectively, filed preliminary conditions pursuant to section 4(e) of the FPA. On May 28, 2009, the Forest Service filed modified 4(e) conditions. A publicly noticed teleconference was held on May 18, 2009, to provide the Forest Service an opportunity to discuss the rationale of the modified 4(e) conditions. These conditions are described under section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*.

**Alternative Section 4(e) Conditions under the Energy Policy Act of 2005**

The Energy Policy Act of 2005 (EPAct) provides parties to this licensing proceeding the opportunity to propose alternatives to preliminary conditions. On July 30, 2008, PG&E filed, with the Commission, a copy of its filing to the Forest Service and BLM proposing alternative 4(e) conditions in response to their preliminary section 4(e) conditions and seeking a trial-type hearing with respect to both Forest Service and BLM 4(e) conditions. As a result of PG&E's alternative 4(e) conditions, BLM withdrew its preliminary 4(e) conditions filed on June 27, 2008, and filed revised preliminary 4(e) conditions on September 11, 2008. On September 18, 2008, PG&E filed with the Commission a withdrawal of its request for a trial-type hearing of BLM's 4(e) conditions. On December 11, 2008, PG&E's withdrawal of its alternative 4(e) conditions to BLM's preliminary 4(e) conditions were filed with the Commission. Additionally, on July 30, 2008, the California Sportfishing Protection Alliance, Friends of Butte Creek, American Whitewater, and Friends of the River (collectively, the Conservation Groups) filed alternative 4(e) conditions. The Forest Service responded to the Conservation Groups alternative 4(e) conditions on April 27, 2009.

Both PG&E's and the Conservation Groups' alternative 4(e) conditions to the Forest Service's preliminary 4(e) conditions include alternatives to provide minimum stream flows and aquatic biological monitoring. These alternative conditions provided by PG&E and the Conservation Groups are analyzed within the corresponding resource areas in section 3, *Environmental Analysis*, and section 5.2, *Comprehensive Development and Recommended Alternative*.

The Forest Service responded to PG&E's alternative 4(e) conditions in its modified 4(e) conditions filed on April 27, 2009. Under separate cover, also on April 27, 2009, the Forest Service responded to the Conservation Groups' alternative 4(e) conditions.

#### 1.3.1.3 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

The U.S. Fish and Wildlife Service (FWS) (on June 27, 2008), NMFS, and the California Department of Fish and Game (Cal Fish & Game) timely filed (each on June 30, 2008), recommendations under section 10(j), as summarized in table 5-3, in section 5.4.1, *Recommendations of Fish and Wildlife Agencies*.

On January 14, 2009, we issued letters to NMFS, Cal Fish & Game, and FWS providing our finding of inconsistency of many of the 10(j) recommendations made. In response, the agencies, under separate cover and on February 27, 2009, requested a 10(j) meeting. In response to the requests, Commission staff held a meeting on April 13, 2009, with the agencies in an attempt to resolve apparent inconsistencies between their 10(j) recommendations and the FPA. Two additional follow-up meetings were held on May 18, 2009, and June 29, 2009. In section 5.4, we discuss how we address the agency recommendations and summarize efforts made to resolve the 10(j) inconsistencies with the FPA.

### 1.3.2 Clean Water Act

Under section 401 of the Clean Water Act, a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the Clean Water Act. On June 17, 2008, PG&E applied to the California Water

Resources Control Board (Water Board) for 401 water quality certification (WQC) for the DeSabla-Centerville Hydroelectric Project. On May 29, 2009, PG&E withdrew its application for a 401 WQC and simultaneously reapplied. The Water Board has not yet acted on the application. The WQC is due by May 29, 2010.

### 1.3.3 Endangered Species 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 the critical habitat of such species. The federally listed species known to occur in the DeSabla-Centerville Hydroelectric Project's vicinity are the Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and the Central Valley steelhead (*O. mykiss*), each of which have designated critical habitat within the project area; the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB); and the California red-legged frog (*Rana aurora draytonii*). Our analyses of project impacts on threatened and endangered species are presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

We conclude that relicensing of the DeSabla-Centerville Hydroelectric Project, as proposed with staff-recommended measures, could adversely affect the threatened VELB. We requested FWS concurrence with our conclusion by letter dated January 14, 2009. FWS concurred with our determination on March 24, 2009 (letter from C. Goude, Acting Field Supervisor, FWS, Sacramento, CA, to K.D. Bose, Secretary, FERC, Washington, DC).

We conclude that relicensing of the project, as proposed with staff-recommended measures, would not likely adversely affect the threatened California red-legged frog because of lack of suitable habitat. Further, the project is not located within designated or proposed critical habitat for the frog. We requested FWS concurrence with our conclusion by letter dated January 14, 2009. FWS concurred with our determination on March 24, 2009 (letter from C. Goude, Acting Field Supervisor, FWS, Sacramento, CA, to K.D. Bose, Secretary, FERC, Washington, DC).

We conclude that relicensing of the DeSabla-Centerville Hydroelectric Project, as proposed with staff-recommended measures, could adversely affect the Central Valley spring-run Chinook salmon *(Oncorhynchus tshawytscha)* and its designated critical habitat, and the Central Valley steelhead *(O. mykiss)*. Even with the benefits the project provides to spring-run Chinook salmon and the steelhead, and their habitats, the project may still result in the incidental take of these species or adversely modify spring-run Chinook habitat as a result of an unanticipated shut-down of project facilities or other malfunctions. Therefore, we conclude that relicensing the project may adversely affect

these species and the spring-run Chinook salmon's designated critical habitat. We requested formal consultation with NMFS by letter dated January 15, 2009. On June 15, 2009, NMFS acknowledged our January 15 letter and requested additional information, before it could initiate formal consultation. The requested information has been provided within the final EA/revised biological assessment.

We conclude that relicensing of the DeSabla-Centerville Hydroelectric Project, as proposed with staff-recommended measures, would not likely adversely affect the federally listed Southern Distinct Population Segment of the North American green sturgeon (*Acipenser medirostris*) because green sturgeon are not found within Butte Creek and the inter-basin transfer of water from the West Branch Feather River to Butte Creek may only marginally influence the magnitude of flows and water quality downstream of Oroville dam in the lower Feather River where green sturgeon have been observed. NMFS provided us with its concurrence via e-mail on July 9, 2009.[10]

### 1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act, 16 U.S.C. §1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state Coastal Zone Management Act agency concurs with the license applicant's certification of consistency with the state's coastal zone management program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The DeSabla-Centerville Hydroelectric Project is not located within the state-designated coastal zone, which extends from a few blocks to 5 miles inland from the sea (www.ceres.ca.gov/coastal.com), and relicensing the project would not affect California's coastal resources. Therefore, the project is not subject to California coastal zone program review, and no consistency certification is needed.

### 1.3.5 National Historic Preservation Act

Section 106 requires that federal agencies "take into account" how the agency's undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission intends to execute a programmatic agreement (PA) with the California State Historic Preservation Officer

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[10] E-mail communication memo and copy of the e-mail was filed into the Commission's record on July 14, 2009.

(SHPO) for the protection of historic properties from the effects of the operation of the DeSabla-Centerville Hydroelectric Project. The terms of the PA would ensure that PG&E addresses and treats all historic properties identified within the project's area of potential effects (APE) through the implementation of the existing Historic Properties Management Plan (HPMP). We intend to issue the PA in July 2009.

### 1.3.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with NMFS on all actions that may adversely affect essential fish habitat (EFH). Within the project area, EFH has been established by NMFS in the project area in Butte Creek between Parrott-Phelan diversion dam and Lower Centerville diversion dam for spring-run Chinook salmon, fall-run Chinook salmon, and late fall-run Chinook salmon (collectively Chinook salmon).[11]

With this final EA, we recommend a number of measures for the betterment of Chinook salmon and its habitat. However, even with the benefits the project provides to the established Chinook salmon EFH, the project may still adversely affect the EFH as a result of an unanticipated shut-down of project facilities or other malfunctions. Therefore, we conclude that relicensing the project may adversely affect the Chinook salmon's designated EFH within Butte Creek, and, with this final EA, we are requesting consultation with NMFS pursuant to the Magnuson-Stevens Act.

### 1.3.7 California Environmental Quality Act

The California Environmental Quality Act (CEQA) is the California counterpart to the National Environmental Policy Act (NEPA). CEQA went into effect in 1970 for the purpose of monitoring land development in California through a permitting process. This statute, enacted to protect the health of the environment from current and future development, requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA applies to all discretionary activities proposed to be undertaken or approved by California state and local government agencies. For the DeSabla-Centerville Hydroelectric Project, the Water Board is a responsible state permitting agency under CEQA, as it must act on PG&E's request for WQC for the project (see section 1.3.2, *Clean Water Act*).

Under CEQA, an environmental impact report (EIR) is prepared when the public agency finds substantial evidence that the project may have a significant effect on the environment. An EIR is the public document used to analyze the significant environmental effects of a proposed project, to identify alternatives, and to disclose

[11] Section 4.7 of PG&E's final license application.

possible ways to reduce or avoid the possible environmental damage. CEQA guidelines state that when federal review of a project is also required, state agencies are encouraged to integrate the two processes to the fullest extent possible, which may include a joint EA or environmental impact statement (EIS) and EIR. While this document is not a joint EA/EIR, the Water Board has the opportunity to use this document, as appropriate, to satisfy its responsibilities under CEQA. The Water Board in its comments on the draft EA stated that because NEPA does not specifically identify "significant impacts" additional analysis may be required to comply with CEQA; as such the Water Board may use our final environmental analysis along with any additional analysis it deems necessary to comply with CEQA.

One element needed in an EIR, but not required by NEPA, is a discussion of a program for monitoring or reporting on mitigation measures that were adopted or made conditions of project approval. The monitoring or reporting program must ensure compliance with mitigation measures during project implementation. The program may also provide information on the effectiveness of mitigation measures. Although discussion of the mitigation reporting or monitoring program can be deferred until the final EIR or, in some cases, after project approval, it is often included in the draft EIR to obtain public review and comment.

In section 3 of this final EA, we describe each potential environmental resource impact, our analysis of each recommended mitigation measure, and our conclusion with respect to the effectiveness of each measure in addressing the impact. In section 5.2, *Comprehensive Development and Recommended Alternative*, we list the mitigation measures and monitoring and reporting requirements we recommend for inclusion in any license issued for the DeSabla-Centerville Hydroelectric Project. In appendix A, we include draft license articles if the project were to be licensed as recommended by staff, and inclusive of mandatory conditions provided by other agencies. Additionally, any conditions of a WQC that may be issued for this project will become an enforceable part of any license issued for this project.

To specifically address CEQA requirements with respect to mitigation monitoring, appendix B, *DeSabla-Centerville Project Mitigation and Monitoring Summary,* identifies each potentially significant impact of relicensing the DeSabla-Centerville Hydroelectric Project. It also lists the project changes or mitigation measures that are recommended for inclusion in a new license to avoid or reduce the impact, and describes the monitoring and reporting measures would undertake to ensure the project changes and mitigation measures are implemented as intended.

Regarding growth-inducing impacts caused by the project, an analysis required under CEQA but not required in an EA or EIS, for this relicensing, we find that the higher minimum instream flows that we are recommending would translate to less annual

power generation of the project. A net reduction in power generation would not facilitate population growth or remove an obstacle to growth.

## 1.4 PUBLIC REVIEW AND CONSULTATION

The Commission's regulations (18 CFR, sections 5.1 – 5.16) require that applicants consult with appropriate resource agencies, Tribes, and other entities before filing an application. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, ESA, the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

### 1.4.1 Scoping

Before preparing this final EA, we conducted scoping to determine what issues and alternatives should be addressed. A Scoping Document was distributed to interested agencies and others on October 19, 2004. It was noticed in the Federal Register on October 25, 2004. Two scoping meetings were held on November 17-18, 2004, in Chico, California, to solicit oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

| Commenting Entities | Date Filed |
|---|---|
| The Forest Service | January 28, 2005 |
| FWS | January 31, 2005 |
| Cal Fish & Game | January 31, 2005 |
| Sacramento River Preservation Trust | January 31, 2005 |
| Friends of the River | February 1, 2005 |
| PG&E | February 1, 2005 |
| U.S. National Park Service | February 1, 2005 |
| The Water Board | February 1, 2005 |
| Chico Paddleheads | February 2, 2005 |
| NMFS | February 2, 2005 |

A revised Scoping Document, addressing these comments, was issued on March 18, 2005.

### 1.4.2 Interventions

On May 1, 2008, the Commission issued a public notice accepting the application and soliciting motions to intervene, with a filing deadline of Monday, June 30, 2008. In response to the notice, the following entities filed motions to intervene:

| Intervening Party | Date Filed |
|---|---|
| California Sportfishing Protection Alliance, et. al. | June 16, 2008 |
| The Water Board | June 23, 2008 |
| U.S. Department of the Interior | June 27, 2008 |
| The Forest Service | June 27, 2008 |
| Sackheim Consulting | June 30, 2008 |
| Cal Fish & Game | June 30, 2008 |
| NMFS | June 30, 2008 |
| Gerald M. Lutticken, P.E. | June 30, 2008 |

### 1.4.3 Comments on the License Application

In addition to interventions, the May 1, 2008, notice solicited comments on the license application. The following entities filed comments:

| Commenting Agencies and other Entities | Date Filed |
|---|---|
| Greenville Rancheria | June 19, 2008 |
| M&T Ranch | June 25, 2008 |
| Lars Estrem | June 26, 2008 |
| FWS | June 27, 2008 |
| California Sportfishing Protection Alliance | June 27, 2008 |
| The Forest Service | June 27, 2008 |

| | |
|---|---|
| Sacramento Valley Land Owners Assoc. | June 30, 2008 |
| John S. Blacklock | June 30, 2008 |
| Butte County, California | June 30, 2008 |
| Cal Fish & Game | June 30, 2008 |
| NMFS | June 30, 2008 |
| California Sportfishing Protection Alliance | June 30, 2008 |
| James Gaumer | July 2, 2008 |
| Richard Theiriot | July 7, 2008 |
| Butte Creek Watershed Conservancy | July 15, 2008 |
| California Salmon and Steelhead Association | September 22, 2008 |

PG&E filed reply comments on August 14, 2008.

### 1.4.4 Comments on the Draft Environmental Assessment

On December 29, 2008, the Commission issued a draft EA for the DeSabla-Centerville Hydroelectric Project. Comments on the draft EA were due by February 27, 2009. The following entities filed comments:

| **Commenting Agencies and other Entities** | **Date Filed** |
|---|---|
| PG&E | February 26, 2009 |
| The Water Board | February 26, 2009 |
| Conservation Groups[12] | February 26, 2009 |
| FWS | February 27, 2009 |
| Butte County, California | February 27, 2009 |

[12] The Conservation Groups comprise representatives from the California Sportfishing Protection Alliance, Friends of Butte Creek, American Whitewater, and Friends of the River.

| | |
|---|---|
| NMFS | February 27, 2009 |
| Cal Fish & Game | February 27, 2009 |
| The Forest Service | February 27, 2009 |
| Sackheim Consulting | March 2, 2009 |
| Jeremiah M. Karuzas | March 4, 2009 |
| Butte County, California (errata to previous filing) | March 20, 2009 |

Appendix C summarizes the comments that were filed, includes our responses to those comments, and indicates where we made modifications to the draft EA. PG&E filed reply comments on March 30, 2009, and in response to FWS, NMFS, and Cal Fish & Game's comments on the draft EA and our section 10(j) Preliminary Determination of Inconsistency.

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# 2.0 PROPOSED ACTION AND ALTERNATIVES

## 2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, we use existing conditions as the baseline environmental condition for comparison with other alternatives. Thus the project would continue to operate under the terms and conditions of the current license. The no-action alternative includes the existing facilities and current project operation.

### 2.1.1 Existing Project Facilities

The DeSabla-Centerville Hydroelectric Project is divided into three developments: Toadtown, DeSabla, and Centerville. The physical elements of each development are described below generally following the flow of water through each development. The Toadtown development diverts water from the West Branch Feather River. The DeSabla development diverts water from upper Butte Creek as well as using the outflow of the Toadtown development. The downstream Centerville development diverts the flow of Butte Creek downstream of the DeSabla development (see figure 1-2).

The Toadtown development, which diverts water from the West Branch Feather River basin to the Butte Creek basin, consists of the following constructed facilities: (1) Round Valley reservoir, a 98 acre reservoir with a gross storage capacity of 1,700 acre-feet; (2) Round Valley dam, an earthfill dam, 29-feet-high and 810-feet-long; (3) a 40-foot-wide overflow spillway; (4) a 15-inch outlet pipe at the base of Round Valley dam, and manual low level outlet valve; (5) Philbrook reservoir, a 173 acre reservoir with a gross storage capacity of 4,985 acre-feet; (6) Philbrook main dam (located on Philbrook Creek), a compacted earthfill dam, 87-feet-high and 850-feet-long; (7) Philbrook auxiliary dam (170 feet to the right of the main dam), a compacted earthfill dam, 24-feet-high and 470-feet-long; (8) a 29.7-foot wide spillway with 5 flashboard bays; (9) a 10.75-foot-long and 14.75-foot-wide spillway with a single, manual radial gate; (10) a 33-inch diameter, 460-foot-long outlet conduit from Philbrook reservoir; (11) a 17-foot-high, 8-feet diameter submerged vertical concrete intake, controlled by a 30-inch diameter manual needle valve; (12) Hendricks diversion dam, a concrete gravity dam, 15-feet-high with an overflow spillway section 98-feet-wide; (13) an 8.66-mile-long Hendricks canal, composed mostly of earthen ditch with several flume and tunnel sections, with a capacity of 125 cubic feet per second (cfs); (14) feeder diversions from 4 creeks into Hendricks/ Toadtown canal; (15) a 40-inch diameter, 1,556-foot-long steel penstock; (16) Toadtown powerhouse, a 28 by 44 foot reinforced concrete building, with one turbine-generator unit and a normal operating capacity of 1.5 MW; (17) a 1,500-foot-long 12 kilovolt tap line connecting Toadtown powerhouse to a distribution system; and (18) appurtenant facilities.

The DeSabla development, which diverts water from upper Butte Creek and uses the outflow of the Toadtown development, consists of the following constructed

facilities: (1) the 2.4-mile-long Toadtown canal, an earthen canal with a capacity of 125 cfs; (2) Butte Creek diversion dam, a 50-foot-high, 100-foot-long, concrete arch dam with an overflow spillway; (3) a 11.4-mile-long Butte canal, composed of earthen berm sections, gunited sections, tunnel sections, a siphon, and flume sections, with a capacity of 91 cfs; (4) a 0.7-mile-long canal that combines Butte canal with Toadtown canal, with a capacity of 191 cfs; (5) feeder diversions from 4 creeks that flow into Butte canal (one is not in use); (6) DeSabla dam, a 50-foot-high, 100-foot-wide earthen embankment with a spillway canal; (7) DeSabla forebay, a 15 acre reservoir with a gross storage capacity of 163 acre-feet; (8) a 66-inch diameter, reduced to 42-inch diameter, 1.3-mile-long steel penstock; (9) DeSabla powerhouse, a 26.5 by 41 foot reinforced concrete building, with one turbine generator unit and a normal operating capacity of 18.5 MW; (10) a 0.25-mile long transmission tapline connecting DeSabla powerhouse to the 60 kilovolt Oro Fino Tap Line; and (11) appurtenant facilities.

The Centerville development, which diverts the flow of Butte Creek downstream of the DeSabla development, consists of the following constructed facilities: (1) the Upper Centerville canal, that originates at DeSabla powerhouse and ends at Helltown Ravine (currently carries a few cfs for local water uses but has not been used for power generation for many years); (2) Lower Centerville diversion dam, a 12-foot-high, 72.5-foot-wide concrete arch dam with an overflow spillway; (3) an 8-mile-long Lower Centerville canal, composed of earthen canal and several flume sections, with a capacity of 183 cfs; (4) feeder diversions from 3 creeks that flow into Lower Centerville canal (all three are no longer in use); (5) one 30-inch diameter and one 42-inch diameter, reduced to 36-inch diameter, 2,559-foot-long steel penstocks; (6) Centerville forebay, a 27 by 37 foot concrete header box with a spillway channel; (7) Centerville powerhouse, a 32 by 109 foot reinforced concrete building, with two turbine-generator units and a total normal operating capacity of 6.4 MW; and (8) appurtenant facilities.

As PG&E proposes, the project boundary would enclose these facilities: (1) Round Valley dam and reservoir; (2) Philbrook dam and reservoir; (3) DeSabla dam and forebay; (4) Hendricks diversion with flow supplemented by these feeder diversions: Long Ravine, Cunningham Ravine, and Little West Fork; (5) Butte Creek diversion with flow supplemented by these feeder diversions: Inskip Creek, Kelsey Creek, and Clear Creek; (6)Lower Centerville diversion; (7) Hendricks canal; (8) Butte Creek canal; (9) Toadtown canal; (10) Lower Centerville canal; (11) Upper Centerville canal; (12) Toadtown powerhouse; (13) DeSabla powerhouse; (14) Centerville powerhouse; (15) Toadtown powerhouse tap line; and (16) DeSabla powerhouse tap line.

The existing project includes the following recreational facilities at Philbrook reservoir: Philbrook Campground; Philbrook Picnic and Camping Overflow Area; and Philbrook Angler Access (boat launch). The existing project includes the DeSabla Group Picnic Area at the DeSabla forebay. Also, PG&E has authorized the installation of 21

private, residential boat docks on the east end of Philbrook reservoir and a courtesy dock to the Pacific Service Employees Association Camp DeSabla on the DeSabla forebay.

PG&E proposes to delete five stream[13] diversions because they have not been used for more than 10 years.

### 2.1.2 Project Safety

The project has been operating for more than 28 years under the existing license. During this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. Table 2-1 is a list of all DeSabla-Centerville Hydroelectric Project dams.

Table 2-1. DeSabla-Centerville Hydroelectric dams. (Source: PG&E, as modified by staff)

| FERC Dam Name | Type | NAT DAM No. |
|---|---|---|
| Round Valley | Storage | CA00346 |
| Philbrook Main | Storage | CA00345 |
| Philbrook Saddle | Storage | CA83035 |
| DeSabla | Forebay | CA00343 |
| Cunningham Ravine | Feeder | CA83036 |
| Little West Fork | Feeder | CA83037 |
| Butte Creek (also known as Butte Head) | Diversion | CA83038 |
| Inskip Creek | Feeder | CA83039 |
| Kelsey Creek | Feeder | CA00698 |
| Clear Creek | Feeder | CA83040 |
| Little Butte Creek | Feeder | CA83041 |
| Lower Centerville | Diversion | CA83042 |
| Header Box | Intake | CA83043 |
| Hendricks diversion (also known as Hendricks Head) | Diversion | CA00702 |
| Long Ravine | Diversion | CA83044 |

[13] The five stream diversions are: Oro Fino Ravine, Emma Ravine, Coal Claim Ravine feeder diversions located the Lower Centerville canal; Stevens Creek feeder on the Butte canal; and Little Butte Creek feeder on the Hendricks canal.

All project dams are classified as "Low Hazard Potential" dams by Commission guidelines and are exempted from Part 12, Subpart C, of the Commission's Regulations for Emergency Action Plans with the exception of the Philbrook dams. Currently, the Philbrook dams are the only project dams subject to the Part 12, Subpart D, of the Commission's Regulations (Five-Year Consultant Safety Inspection Report Program) for which consultant safety inspection reports are currently being prepared.

Under the Part 12(D) requirements the Philbrook dams are inspected and evaluated every 5 years by an independent consultant and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, the Commission staff would evaluate the continued adequacy of the proposed project facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff would continue to inspect the project during the new license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

### 2.1.3 Existing Project Operation

The DeSabla-Centerville Hydroelectric Project is operated primarily as run-of-the-river and operates on a continuous basis. During winter and spring, base flows in the West Branch Feather River and Butte Creek typically provide adequate flow for full operation of project powerhouses. However, during summer months, available base flow water is augmented by water releases from storage at Round Valley and Philbrook reservoirs. During fall months project powerhouses are operated at reduced capacities due to low stream flows. Figure 1-2 shows a schematic diagram of where water is diverted for project operation.

Seasonal operation of the project manages basin runoff through the annual hydrologic cycle to best achieve project purposes/objectives including regulatory requirements, recreation, flood control, irrigation, municipal water supply, and power generation. In 1999, the Central Valley spring-run Chinook salmon (Chinook salmon) were designated as a threatened species under the ESA. Since then, PG&E has operated the project under an annual Project Operations and Maintenance Plan developed each spring in consultation with Cal Fish & Game, NMFS, and FWS. This plan outlines the operation and maintenance procedures and practices PG&E follows to enhance and protect this habitat for Chinook salmon. This Operations and Maintenance Plan also provides the basis for the reservoir temperature release criteria established in the Commission's August 21, 1997, order,[14] as amended August 20, 1998.[15]

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[14] 80 FERC ¶ 62171 (1997).
[15] 84 FERC ¶ 62165 (1998).

Direct precipitation and snowmelt runoff are captured in the project's storage reservoirs (Philbrook and Round Valley) and are also partially diverted at each of the project's diversion dams. Releases from the storage reservoirs are conveyed by the West Branch Feather River first to the Hendricks diversion dam.

During normal hydrologic conditions, as determined by snowpack on approximately April 1, the flow through the low level valve at Round Valley dam is typically reduced to supply only a minimum streamflow requirement of 0.5 cfs to the West Branch Feather River. Once the valve opening is reduced, the reservoir fills and then spills during the spring snowmelt. As spring runoff subsides and the natural stream flow of the West Branch Feather River is no longer adequate to meet the 125 cfs carrying capacity of the downstream Hendricks canal plus the minimum instream flow requirements for downstream of the Hendricks diversion dam, the low level valve is again opened and water is released from storage to augment the natural stream flow for diversion at the Hendricks canal. In normal water years this typically begins in mid-June and Round Valley reservoir will typically be completely drained in about one month. The low level valve will remain fully open until it is partially closed the following spring and the cycle is repeated.

During all water year types Philbrook reservoir is operated to meet a continuous 2 cfs minimum instream flow requirement in Philbrook Creek. This release is made through the single low level outlet. The reservoir is allowed to fill during the spring months when the radial gate is closed around April 1. Flow from Philbrook reservoir is controlled by two spillways. The reservoir is allowed to fill during the spring months when the radial gate, on the newest spillway, is closed around April 1. Flashboards, on the oldest spillway, are also used to control flow from the Philbrook reservoir. Care is taken that the reservoir water level does not exceed the maximum water surface elevation. As the natural stream flow of the West Branch Feather River and storage flows provided by Round Valley reservoir are no longer adequate to meet carrying capacity of the downstream Hendricks canal (up to 125 cfs) and minimum flow requirements for the West Branch Feather River, storage flows from Philbrook reservoir are released.

To help maintain the cool water habitat in Butte Creek and below Centerville powerhouse for Chinook salmon, accelerated releases are made from the reservoir during periods of high temperature in July and August in accordance with the annual Operations and Maintenance Plan. Releases from storage in Philbrook reservoir typically end by mid-September.

At the Hendricks diversion dam, up to 125 cfs of the West Branch Feather River's flow is diverted into the Hendricks canal while the remainder of flow is allowed to pass downstream. However, during low flow periods the entire flow of the West Branch Feather River is diverted into the canal and an instream flow release of 15 cfs and 7 cfs,

during normal and dry years, respectively, are made from the canal back into the river immediately downstream of the dam. The Hendricks canal has a maximum hydraulic capacity of 125 cfs. Flows within the Hendricks canal are also augmented through several feeder diversions (Long Ravine, Cunningham Ravine, and Little West Fork Feather River, and Little Butte Creek). Ultimately flows within the Hendricks canal are passed through the Toadtown powerhouse and then discharged into Toadtown canal which travels to its confluence with Butte canal.

Butte canal originates at the Butte Creek diversion dam. Flows are diverted at this structure into Butte canal, and three feeder diversions (Inskip, Kelsey, and Clear creeks) augment flows over the length of the canal. Butte canal ultimately joins with Toadtown canal and is then carried 0.7 miles downstream to the DeSabla forebay. Water is discharged from the DeSabla forebay to DeSabla powerhouse via the 1.3-mile long steel penstock. Also, from the DeSabla forebay approximately 3 cfs is provided to the Upper Centerville canal to satisfy local water rights.

Water used at DeSabla powerhouse is discharged into Butte Creek above the Lower Centerville diversion dam. Up to approximately 183 cfs of the Butte Creek stream flow is diverted from Butte Creek into the Lower Centerville canal at the Lower Centerville diversion dam. The 8-mile-long Lower Centerville canal carries water to Centerville penstock and powerhouse where it is then released back into Butte Creek.

The project includes four in-basin (Butte Creek to Butte Creek) water transfers (table 2-2) and six out-of basin (West Branch Feather River to Butte Creek) water transfers (table 2-3) resulting in ten "project reaches" in which stream flows are affected by project operations. Each reach is named after the project facility from which the flow is affected.

Table 2-2. DeSabla-Centerville Hydroelectric Project in-basin project reaches for water transfers. (Source: PG&E, 2007, as modified by staff)

| Name | Description |
|---|---|
| Butte Creek diversion dam bypassed reach | The 10.1-mile-long (gradient of 162 feet per mile, or 0.031%) section of Butte Creek from the base of the Butte Creek diversion dam (elevation [El.] 2,880 feet) to the DeSabla powerhouse tailrace (El. 1,240 feet). Note that this reach includes the Forks of Butte diversion dam (non-project) and the Forks of Butte powerhouse tailrace and inflow (non-project). |
| DeSabla powerhouse reach | The 0.1-mile-long (gradient of 400 feet per mile, or 0.076%) section of Butte Creek from the DeSabla powerhouse tailrace (El. 1,240 feet) to the Lower Centerville diversion dam (El. 1,200 feet). |

| Name | Description |
|---|---|
| Lower Centerville diversion dam bypassed reach | The 6.4-mile-long (gradient of 108 feet per mile, or 0.020%) section of Butte Creek from the base of the Lower Centerville diversion dam (El. 1,200 feet) to the Centerville powerhouse tailrace (El. 510 feet). |
| Centerville powerhouse reach | The 9.0-mile-long (gradient of 28 feet per mile, or 0.005%) section of Butte Creek from the Centerville powerhouse tailrace (El. 510 feet) to the Parrott-Phelan diversion dam (El. 260 feet). |

Table 2-3. DeSabla-Centerville Hydroelectric Project out-of-basin reaches for water transfers. (Source: PG&E, as modified by staff)

| Name | Description |
|---|---|
| Round Valley dam reach | The 4.9-mile-long (gradient of 169 feet per mile, or 0.032%) section of the West Branch Feather River from the base of Round Valley dam (El. 5,627.0 feet) to the confluence with Philbrook Creek (El. 4,800 feet). |
| Philbrook dam reach | The 2.3-mile-long (gradient of 291 feet per mile, or 0.055%) section of Philbrook Creek from the base of Philbrook dam (El. 5,469 feet) to the confluence with West Branch Feather River (El. 4,800 feet). |
| West Branch Feather River and Philbrook Creek confluence reach | The 9.6-mile-long (gradient of 163 feet per mile, or 0.031%) section of the West Branch Feather River from the confluence with Philbrook Creek (El. 4,800 ft) to Hendricks diversion dam (El. 3,240 feet). |
| Hendricks diversion dam bypassed reach | The 14-mile-long (gradient of 121 feet per mile, or 0.023%) section of the West Branch Feather River from the base of Hendricks diversion dam (El. 3,240 feet) to the Miocene diversion dam (El. 1,540 feet). |
| Hendricks canal at Long Ravine confluence reach | The 0.7-mile-long (gradient of 171 feet/mile, or 0.032%) section of Long Ravine from the outlet of the Hendricks canal (El. 3,230 feet) to the base of Long Ravine diversion dam (El. 3,110 feet). |
| Long Ravine diversion dam bypassed reach | The 1.7-mile-long (gradient of 218 feet per mile, or 0.041%) section of Long Ravine from the base of Long Ravine diversion dam (El. 3,110 feet) to the confluence with the Little West Fork (El. 2,740 feet). |

### 2.1.4 Existing Environmental Measures

#### Water Quality and Water Quantity

For the protection of water resources, PG&E currently provides the following minimum instream flows at the project (table 2-4).

Table 2-4. Current minimum instream flows (in cfs) downstream of project diversions. (Source: PG&E, 2007a)

| | Volume of Discharge (in cfs) During Normal and Dry Water Year Types | | |
|---|---|---|---|
| **Point of Diversion** | **Normal** | **Dry** | **Time Period** |
| Round Valley reservoir | 0.5 | 0.1 | Year-round |
| Philbrook reservoir | 2 | 2 | Year-round |
| Hendricks diversion dam | 15 | 7 | Year-round |
| Butte Creek diversion dam | 16 | 7 | Year-round |
| Lower Centerville diversion dam | 40 | 10 | Sept. 15-Oct. 31 and Dec. 15–May 31 |
| | 30 | 10 | Nov. 11-Dec. 14 |
| | 40 | 40 | June 1-Sept. 14 |
| Inskip Creek | 0.25 | 0.1 | Year-round |
| Kelsey Creek | 0.25 | 0.1 | Year-round |
| Stevens Creek | 0.25 | 0.1 | Discontinued |
| Emma Ravine | 0.25 | 0.1 | Discontinued |
| Coal Claim Ravine | 0.25 | 0.1 | Discontinued |
| Oro Fino Ravine | 0.25 | 0.1 | Discontinued |
| Little West Fork | 0.25 | 0.1 | Year-round |
| Cunningham Ravine | 0.25 | 0.1 | Year-round |
| Clear Creek | 0.5 | 0.25 | Year-round |
| Long Ravine | 0.5 | 0.25 | Year-round |

### Fishery Resources

For the protection of fishery resources, PG&E conducts fish rescues from project canals, provides minimum instream flows to project bypassed reaches, and operates the project for the benefit of the federally listed Chinook salmon and steelhead.

### Terrestrial Resources

For the protection of terrestrial resources, PG&E maintains deer protection facilities on project canals, including fencing, wooden crossings, and escape ramps; partially funded the purchase of Butte Creek House Meadow, funded restoration projects and installed five waterfowl nesting platforms at the meadow; and implements the March 2003 Valley Elderberry Longhorn Beetle Conservation Program.[16] [17] This conservation program requires the licensee to conduct pre-construction surveys, where necessary, and to provide educational training for construction crews responsible for operation and maintenance activities.

### Recreational Resources

For the protection of recreational resources, PG&E provides for stocking of catchable trout for a put-and-take fishery in DeSabla forebay and Butte Creek; and maintains and operates recreation facilities at project impoundments.

## 2.2 APPLICANT'S PROPOSAL

### 2.2.1 Proposed Project Facilities

Although PG&E did not propose any new facilities in its license application and only proposed to remove five feeder diversions, during the April 13, 2009, section 10(j) meeting, PG&E proposed to construct a water temperature improvement facility within the DeSabla forebay. Specifically, the facility would consist of an approximately 1,300-foot-long, 6-foot-in-diameter pipe that would connect the terminus of Butte canal with the DeSabla forebay intake. A small weir just below the intake spillway would be constructed to provide the required head (approximately 4 feet), allowing surges in the pipe to spill into the forebay.

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[16] The Valley Elderberry Longhorn Beetle Conservation Program was developed by PG&E and FWS.

[17] The deer protection measures and waterfowl measures are license requirements (original license article 39) and the VELB Program is voluntary.

### 2.2.2 Proposed Project Operation

PG&E does not propose any change to existing project operations except for the following proposed minimum instream flows at the following locations:

**West Branch Feather River below Hendricks diversion dam**

- March 1st to May 31st: 30 cfs (normal water year); 20 cfs (dry water year)
- June 1st to February 28th/29th: 20 cfs (normal water year); 7 cfs (dry water year)

**Butte Creek below Butte Creek diversion dam**

- March 1st – May 31st: 30 cfs (normal water year); 20 cfs (dry water year)
- June 1st – February 28th/29th: 16 cfs (normal water year): 7 cfs (dry water year)

**Butte Creek below Lower Centerville diversion dam**

- September 15th – January 31st: 75 cfs (normal water year); 60 cfs (dry water year)
- February 1st – April 30th: 80 cfs (normal water year); 75 cfs (dry water year)
- May 1st – May 31st: 80 cfs (normal water year); 65 cfs (dry water year)
- June 1st – September 14th: 40 cfs (normal water year); 40 cfs (dry water year)

### 2.2.3 Proposed Environmental Measures

For the purpose of protecting resources from, or mitigating impacts that may result from the continued operation and maintenance of the project, or for the purpose of enhancing the project-affected environment, PG&E proposes that the following measures be included in any new license issued by the Commission. Where we make minor modifications to a measure proposed by PG&E, we indicate modifications in *italic* text.

#### 2.2.3.1 General Measures

- Employee Training - PG&E proposes to provide annually, to its operations and maintenance staff, awareness training on special-status species,

invasive plants, and sensitive areas (special-status plant populations, noxious weed populations, and historic property sites) that are known to occur within the FERC project boundary on National Forest System lands.

- Consultation - PG&E proposes to annually consult with the Forest Service on measures needed to ensure protection and utilization of the National Forest resources affected by the project.

- Special-Status Species - PG&E proposes to annually review the current lists of special-status plant and wildlife species for those that might occur on National Forest System lands in the project area and may be directly affected by project operations. For such newly added species, PG&E proposes to develop and implement a study plan in consultation with the Forest Service to reasonably assess the effects of the project on the species, if warranted.

#### 2.2.3.2 Geology and Soils

- Increased drainage controls (e.g., additional culverts or rolling dips) on several roads to reduce production of fine sediments, replacing a number of damaged and/or temporary culverts, installing velocity dissipators at culvert outlets; and improved management of side case materials during annual road blading activities to minimize erosion and sediment transport potential during future project operations and management. *File a final report describing the results of these road improvement efforts with Cal Fish & Game, NMFS, the Water Board, FWS, the Forest Service, and the Commission within 30 days of completion of these measures.*

- Develop a project transportation system management plan that includes (1) measures to rehabilitate existing erosion damage and minimize further erosion of the project access roads on National Forest System lands; and (2) installation of gates or other vehicle control measures to achieve erosion protection.

- Armor the Round Valley reservoir plunge pool with rip rap and place warning signs to keep visitors away from the steep plunge pool slopes as a means to reduce sediment input to the spillway. *File a final report describing the results of armoring the Round Valley reservoir plunge pool with Cal Fish & Game, NMFS, the Water Board, FWS, the Forest Service, and the Commission within 30 days of completion of these measures.*

- Continue best management practices such as *annually* performing regular aerial and ground patrols, performing periodic canal repairs and removal of

hazard trees, as necessary, and abandoning the use of passively automatic siphonic spill equipment, to reduce the adverse effects of canal failures.

- Develop a Round Valley dam spillway stabilization plan that includes (1) an assessment of areas to be stabilized; (2) feasibility-level design drawings for stabilization measures; and (3) a schedule for implementation of the measures.

- Develop a project canal maintenance and inspection plan that includes (1) annual inspections of the project water conveyance system to identify potential short-term and long-term hazards and to prioritize maintenance and/or mitigation; (2) protocols for routine (non-emergency) canal operations and the use of canal spillways; and (3) stabilization measures to reduce the likelihood of catastrophic canal failure due to hazard trees and geologic hazards and to mitigate sources of chronic erosion and sediment transport into canals.

#### 2.2.3.3 Aquatic Resources

- Develop and implement a canal fish rescue plan *for Butte canal and Lower Centerville canal* that: (1) defines activities that would trigger canal fish rescue efforts; (2) provides for prior notification and coordination with Cal Fish & Game and NMFS; and (3) identifies methods implemented.

- Maintain a minimum pool in Philbrook reservoir of 250 acre-feet to provide winter habitat for trout.

- After consultation with the U.S. Geological Survey (USGS), install and maintain a flow data logger for measuring stream flow downstream of Hendricks diversion dam on the West Branch Feather River, a real-time flow gaging station upstream of Butte Creek diversion dam, and modify the existing stream gaging station near Lower Centerville diversion dam for real-time data access.

- Complete any needed modifications to the stream flow gaging facilities necessary to measure the new minimum instream flows within 3 years after issuance of any new license.

- Provide notice and an explanation to the Commission as soon as possible, but no later than 10 days after, of any temporary modification to minimum instream flow requirements.

- Make the following stream flow information available to the public via the Internet: West Branch Feather River at USGS gage no. 11405200

(downstream of Hendricks diversion dam), Butte Creek at USGS gage nos. 11389720 (downstream of Butte Creek diversion dam) and 111389780 (downstream of Lower Centerville diversion dam).

- Monitor water temperature, dissolved oxygen (DO), turbidity, and herbicides (if in use) in receiving streams, upstream and downstream, of canal discharge within 24 hours prior to, during, and within 24 hours of returning project canals to service, and provide a summary of cleaning and maintenance activities as well as the monitoring results to the Water Board, and file a summary report with the Commission within 30 days of completing the monitoring and any associated laboratory analysis.

- Develop, after consultation with the Forest Service, NMFS, FWS, and Cal Fish & Game, and file for, upon Commission approval, a hazardous substances plan.

- Maintain the following minimum instream flows, or inflow, whichever is less (we note those flows with an asterisk that have been modified from PG&E's proposal and are now adopted as part of the staff alternative):

| | **Proposed Minimum Instream Flow (cfs)** | | |
|---|---|---|---|
| **Point of Discharge** | **Normal Water Year** | **Dry Water Year** | **Time Period** |
| Round Valley dam | 0.5 | 0.1 | Year-round |
| Philbrook dam | 2.0 | 2.0 | Year-round |
| Hendricks diversion dam | *15** | *7** | Year-round |
| Butte Creek diversion dam | 30 | 20 | March 1 to May 31 |
| | 16 | *10** | June 1 to Feb. 28 |
| Lower Centerville diversion dam | 75 | 60 | Sept. 15 to Jan. 31 |
| | 80 | 75 | Feb. 1 to April 30 |
| | 80 | 65 | May 1 to May 31 |
| | 40 | 40 | June 1 to Sept. 14 |
| Inskip, Kelsey, Little West Fork, and Cunningham Ravine creeks | 0.25 | *0.2** | Year-round |
| Clear and Long Ravine creeks | 0.5 | 0.25 | Year-round |

- In wet water years, after consultation with the Forest Service, *NMFS, FWS, and Cal Fish & Game*, release a minimum instream flow of at least 10 cfs to Philbrook Creek between April 1 through May 15, *provided there is an*

*ample snow pack and there is safe access for PG&E employees to adjust the flow release valve and provide notification to the Commission.*[18]

- If it is determined implementing an increased minimum instream flow of 10 cfs during wet water years may compromise Philbrook reservoir storage, after consultation with the Forest Service, *NMFS, FWS, and Cal Fish & Game*, reduce minimum instream flows to flows no less than 2 cfs *and provide notification to the Commission*.

- Implement minimum instream flow requirements triggered by water year type within 2 business days of the publication of the California Department of Water Resource's Bulletin 120.

- Notify the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and the Commission of drought concerns by March 15 of the second or subsequent dry water year and consult with these agencies by May 15 of the same years to discuss operational plans to manage the drought conditions.

- *Develop, after consultation with the Forest Service, FWS, NMFS, Cal Fish & Game, and the Water Board, and file for Commission approval, a feeder creek diversion facility removal plan* for the removal of feeder diversions on Oro Fino Ravine, Emma Ravine, Coal Claim Ravine, Stevens, and Little Butte creeks.

- Develop, after consultation with the *Forest Service, the Water Board, the Conservation Groups*, NMFS, Cal Fish & Game, and FWS, and file for Commission approval, a DeSabla forebay water temperature improvement plan that addresses the installation of a pipe to convey water from the terminus of Butte canal to the DeSabla forebay intake.[19] *Also, include a provision to monitor water temperatures in Butte Creek and DeSabla forebay for a period of 5 years after measures have been implemented and submit annual reports on these results to FWS, NMFS, the Forest Service, Cal Fish & Game, the Water Board, the Conservation Groups, and the Commission*.

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[18] PG&E did not propose this measure in its license application; however, during the April 13, 2009, section 10(j) meeting, PG&E agreed to implement this measure.

[19] In its license application, PG&E proposed to construct a baffle wall facility to reduce thermal loading within the forebay; however, during the April 13, 2009, section 10(j) meeting, PG&E agreed to construct a pipe to reduce thermal loading.

- Develop, after consultation with the Forest Service, the Water Board, NMFS, Cal Fish & Game, and FWS, and file for Commission approval, a long-term operations plan *that includes the development of an annual Project Operations and Maintenance Plan*.

#### 2.2.3.4 Terrestrial Resources

- Annually review current list of special-status species.
- Inspect wildlife bridges and deer escape facilities and replace as necessary.
- Monitor animal losses in project canals.
- Implement a vegetation management plan.
- Implement an invasive weed management plan.

#### 2.2.3.5 Threatened and Endangered Species

- Continue to implement the VELB Conservation Program.

#### 2.2.3.6 Recreation, Land Use, and Aesthetics

- Develop and implement a recreational facility rehabilitation and American with Disabilities Act (ADA) upgrade plan for capital and rehabilitation improvements to the existing recreational facilities at Philbrook reservoir and DeSabla forebay recreation areas.
- Provide streamflow information on project reaches for recreational boating.
- Provide restricted stream access at DeSabla and Centerville powerhouses.
- Develop and implement an operation and maintenance plan for developed recreational facilities at Philbrook reservoir and DeSabla forebay recreational areas.
- Develop and implement a sign and information plan to determine the type of signs, number, and locations of where the signs will be placed at the project.
- Develop and implement a recreation operation plan for the annual operation and maintenance of the existing recreational facilities at Philbrook reservoir and the DeSabla forebay recreation areas.

- Develop a visual management plan to include painting, revegetating, screening, and repairing facilities as well as disposing of debris piles.[20]

- Develop a project transportation system management plan for the protection and maintenance of roads associated with the project.

#### 2.2.3.7 Cultural Resources

- *Within 60 days of license issuance*, implement the February 2008 HPMP *with the following revisions: (1) update the February 2008 HPMP with the additional historic context information provided by BLM, the Forest Service, and the Mechoopda Tribe; (2) develop a collection policy for discovery, curation, and disposition of artifacts, noting that all artifacts from National Forest System lands remain the property of the Forest Service; (3) develop a detailed HPMP section addressing identification, restoration, accessibility, and stewardship collaborations for traditional plant gathering/tending in wetlands and riparian habitat communities culturally important to participating Tribes; (4) identify specific management measures to be undertaken and include them within PG&E's best practices or procedural manuals; and (5) include mitigation measures for the Round Valley reservoir site CA BUT 1225/H, the Philbrook Lake Tenders Cabin, and other sites as determined necessary during consultation with applicable agencies and participating Tribes*.

#### 2.2.3.8 Socioeconomic Resources

PG&E does not propose any measures related to socioeconomic resources.

### 2.2.4 Modifications to Applicant's Proposal

#### 2.2.4.1 Section 18 Prescriptions

FWS and NMFS each filed a reservation of authority to file their section 18 prescriptions on June 27, and June 30, 2008, respectively.

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[20] Debris piles are defined as natural debris such as logs and excess vegetation removed from project reservoirs or water courses currently being stockpiled on Forest Service lands in the vicinity of Philbrook reservoir (personal communications between K. Hogan and S. Murray, Commission, and K. Turner, Forest Service, on July 22, 2009). See memo filed on July 22, 2009.

### 2.2.4.2 Section 4(e) Land Management Conditions

**Forest Service**

The modified conditions provided by the Forest Service on April 28, 2009, and filed under section 4(e) of the FPA are as follows: conditions 1 through 17 are administrative in nature and are standard conditions that would involve obtaining Forest Service approval on final project design and project changes, and yearly consultation with the Forest Service to ensure the protection and development of natural resources, etc. The remaining Forest Service preliminary 4(e) conditions include:

*Geology and Soils*

- Condition 21 - Develop Designs and Implement Actions to Stabilize the Round Valley Spillway Channel - requires PG&E to consult with the Forest Service and other mandatory conditioning agencies to develop designs and implement actions to stabilize the Round Valley dam spillway channel to minimize erosion and reduce sediment contributions to the West Branch Feather River.

- Condition 22 - Implement the Philbrook Spillway Channel Stabilization Plan - requires PG&E to stabilize and maintain the Philbrook spillway channel.

- Condition 23 - Develop and Implement a Project Canal Maintenance, Inspection and Hazard Prevention Plan - requires PG&E to develop and implement a project canal maintenance, inspection, and hazard prevention plan.

*Aquatic Resources*

- Condition 18 - Streamflow - requires specific minimum instream flows for project bypassed reaches, criteria for determining water year type, protocol for dry water years, stream flow measurement, and a ramping rate study.

- Condition 19 - West Branch Feather River Rainbow Trout Population Monitoring Study - requires PG&E to develop and implement a rainbow trout population monitoring study and a habitat and population improvement plan for the West Branch Feather River.

- Condition 20 - Aquatic Biological Monitoring - requires aquatic biota monitoring including fish, foothill yellow-legged frogs, and benthic macroinvertebrates in project-affected bypassed reaches.

- Condition 24 - Develop and Implement Long-term Operations Plan - requires PG&E to develop and implement a long-term operations plan that has a primary goal of seeking to provide cold water for holding, spawning, and rearing spring-run Chinook salmon and steelhead in Butte Creek upstream and downstream from the Centerville powerhouse.

- Condition 25 - Maintain Minimum Pool in Philbrook reservoir - sets the minimum pool volume of Philbrook reservoir at 250 acre-feet.

*Terrestrial Resources*

- Condition 26 - Special Status Species - requires PG&E to annually review current lists of special status species and if new species are identified to likely be found on National Forest System lands, this condition would require PG&E to develop and implement a study to determine the effects of the project on said species.

- Condition 27 - Protection of Forest Service Special Status Species - requires PG&E to prepare a biological evaluation before any ground disturbing activities on National Forest System lands for the continued protection of Forest Service special status species.

- Condition 28 - Canal Wildlife Crossing or Escape Facilities - requires PG&E to consult with the Forest Service and Cal Fish & Game before retrofitting or replacing wildlife bridge crossings or deer escapement facilities along project canals.

- Condition 29 - Monitor Animal Losses in Project Canals - requires PG&E to monitor and record animal mortality in project canals.

- Condition 31 - Vegetation and Invasive Weed Management Plan - requires PG&E to develop and implement a vegetation and invasive weed management plan.

*Threatened and Endangered Species*

- Condition 30 - Valley Elderberry Longhorn Beetle Protection - requires PG&E to comply with the Valley Elderberry Longhorn Beetle Conservation Program.

*Recreation, Land Use, and Aesthetics*[21]

- Condition 33 - Recreation Facilities on or Affecting National Forest System Land - requires PG&E to develop and implement a recreation management plan, and also requires measures to prevent dumping and control off-highway vehicle (OHV) activities on National Forest System lands, provide for a half-time law enforcement position, support reservoir based recreation, and monitor and report recreation usage.

- Condition 34 - Land Resource Plans for Mitigating Project Effects to National Forest System Resources - requires PG&E to develop and implement a land resource management plan including a fire management and response plan, visual management actions plan, sign and information plan, and a hazardous substance plan.

- Condition 36 - Project Transportation System Management Plan - requires the protection of maintenance of roads associated with the project through the development and implementation of a project transportation system management plan, including traffic and road air quality monitoring.

*Cultural Resources*

- Condition 35 - Heritage Properties Management Plan - requires PG&E to develop and file a heritage properties management plan for the purpose of protecting and interpreting heritage resources.

**Bureau of Land Management**

The revised preliminary conditions provided by BLM on September 11, 2008, and filed under section 4(e) of the FPA are as follows: conditions 1 through 17 and 22 are administrative in nature and are standard conditions that would involve obtaining BLM's approval on final project design and project changes, annual consultation with BLM, prior approval for pesticide use, other various measures to ensure the protection and development of natural resources on BLM lands, and a reservation of its section 4(e) authority, etc. The remaining BLM preliminary 4(e) conditions include:

[21] The Forest Service specified in preliminary 4(e) condition 32 that PG&E develop a resolution of encumbrances plan. Since the issuance of the draft EA and with the filing of its modified section 4(e) conditions, the Forest Service has withdrawn condition 32.

*Geology and Soils*

- Condition 21 - Control of Erosion - requires PG&E to control erosion at specified locations.

*Recreation, Land Use, and Aesthetics*

- Condition 18 - Recreation Use Monitoring and Reporting - requires monitoring of recreation use and reporting.

- Condition 19 - Funding to Address Patrol and Maintenance Activities - requires PG&E to pay BLM $30,000 annually for patrol and maintenance activities at the Forks of Butte Creek Recreation Area other lands as agreed to by PG&E and BLM.

- Condition 20 - Maintenance of Portion of Ditch Creek Road - requires the maintenance of portions of Ditch Creek Road.

#### 2.2.4.3 Alternative Section 4(e) Conditions Pursuant to EPAct of 2005

EPAct provides parties to this licensing proceeding the opportunity to propose alternatives to preliminary conditions. On July 30, 2008, PG&E filed, with the Commission, a copy of its filing to the Forest Service and BLM proposing alternative 4(e) conditions in response to their preliminary section 4(e) conditions and seeking a trial-type hearing with respect to both Forest Service and BLM 4(e) conditions. As a result of PG&E's alternative 4(e) conditions, BLM withdrew its preliminary 4(e) conditions filed on June 27, 2008, and filed revised preliminary 4(e) conditions on September 11, 2008. On September 18, 2008, PG&E filed with the Commission a withdrawal of its request for a trial-type hearing of BLM's 4(e) conditions. On December 11, 2008, PG&E filed a withdrawal of its alternative 4(e) conditions to BLM's preliminary 4(e) conditions. Additionally, On July 30, 2008, the Conservation Groups filed alternative 4(e) conditions. The Forest Service responded to the Conservation Groups alternative 4(e) conditions on April 27, 2009.

PG&E filed alternatives to the following Forest Service preliminary conditions:

- Condition 18 (Streamflow), Part 1 - Minimum Streamflow Requirements and Measurement

- Condition 18 (Streamflow), Part 5 - Ramping Rates

- Condition 19 - West Branch Feather River Rainbow Trout Population Monitoring Study

- Condition 20 (Aquatic Biological Monitoring), Part 1 - Fish Monitoring Plan

- Condition 20 (Aquatic Biological Monitoring), Part 2 - Amphibian Monitoring Plan

- Condition 20 (Aquatic Biological Monitoring), Part 3 - Benthic Macroinvertebrate Monitoring

The Conservation Groups filed alternatives to the following Forest Service preliminary conditions:

- Condition 18 (Streamflow)

- Condition 19 - West Branch Feather River Rainbow Trout Population Monitoring Study

## 2.3 STAFF ALTERNATIVE

In addition to PG&E's proposed measures listed above, the staff alternative would include the following measures:

**Geological Resources**

- Reconstruct and maintain any areas of the Butte Creek canal, slope, and road that are detrimentally affected by project activities. After consultation with BLM and within 1 year of license issuance, PG&E should prepare and file a schedule with the Commission for completing these measures.

- Develop and implement a Philbrook spillway channel stabilization plan to mitigate for the current erosion problem below the Philbrook spillway channel. The plan should also include a schedule for filing status reports with the Commission on the ongoing monitoring associated with erosion below the Philbrook spillway channel. Implementation of this plan should be complete by December 1, 2010.

- Because of ongoing erosion monitoring, include lands, starting at the Philbrook spillway channel, extending from the two Philbrook spillways and ending at the confluence with Philbrook Creek, in the project boundary.

**Aquatic Resources**

- Promptly resume minimum instream flow requirements after a non-compliance event and notify the Forest Service, FWS, NMFS, Cal Fish &

Game, the Water Board, and the Commission within 48 hours of this modification.

- Construct and operate a tap off of the DeSabla forebay temperature reduction device (i.e., pipe) to supply any flows to Upper Centerville canal for local water users.

- Provide a minimum instream flow of 1 cfs, or inflow, during normal water years, and a minimum instream flow of 0.5 cfs, or inflow, during dry water years downstream of the Helltown Ravine diversion dam.

- Provide a minimum instream flow of at least 1 cfs to Philbrook Creek when inflow into Philbrook reservoir is less than 0.5 cfs.

- If sufficient water is not available to hold stream levels constant during periods when foothill yellow-legged frog egg masses are present, ramp flows downstream of Butte Creek diversion dam and Lower Centerville diversion dam such that:

    - During downramping, stage changes should not exceed 0.2 foot per second per hour at foothill yellow-legged frog egg mass sites and water levels should not drop so that more than 20 percent of egg masses are de-watered.

    - During upramping, velocity should not change more than 0.2 foot per second per hour and should not exceed 0.8 foot per second at the most sensitive foothill yellow-legged frog egg mass sites.

    - When foothill yellow-legged frog tadpoles or juveniles are present, the up- and downramping rate should be 0.4 foot per second per hour or less and should not exceed 1.0 foot per second at the site.

- Develop, after consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and file for Commission approval, an instream flow-ramping rate study with the objective of measuring the change in water velocities, stream width, and river stage during up- and downramping of flows in the West Branch Feather River.

- Upon completion of the instream flow ramping rate study, file the study results and final project operation ramping rates with the Commission for approval prior to implementation, along with a description of how any velocity-based ramping rates will be monitored for compliance purposes.

- Develop, after consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and file for Commission approval, a ramping rate plan for flows downstream of the main project diversions in Butte Creek. The plan should include, at a minimum, provisions for determining the relationship between project operations and downstream water velocities, a description of how compliance with the above specified ramping rates will be achieved, and provisions for determining if ramping rates are protecting foothill yellow-legged frog populations.

- Schedule the timing of maintenance or other planned project outages to avoid negative ecological effects on foothill yellow-legged frogs and spring-run Chinook salmon and provide written notice, including proposed measures to minimize the magnitude and duration of spills, at least 90 days prior to such outages, to the Forest Service, FWS, NMFS, Cal Fish & Game, the Water Board, and the Commission.

- Obtain approval from the Forest Service and BLM on the use of pesticides on Forest Service or BLM lands and submit a request for approval of planned uses of pesticides for the upcoming year during annual consultation.

- Utilize only pesticides registered by EPA and do not use them within 500 feet of known locations of California red-legged frogs, mountain yellow-legged frogs, foothill yellow-legged frogs, and Yosemite toads.

- Within 30 days of making the final water year type determination, provide notice of this determination to Cal Fish & Game, FWS, NMFS, the Forest Service, the Water Board, and the Commission.

- If drought conditions are evident, include any potential proposals for modified project operations and file these proposals with the Commission for approval.

- Within 1 year of license issuance, construct, operate, and maintain, after consultation with USGS, a streamflow gage with real-time capability in Philbrook Creek, downstream of the confluence of both the low level release and spill channel in Philbrook Creek.

- Operate and maintain the existing gaging stations on the West Branch Feather River downstream of Round Valley reservoir and the Hendricks diversion dam.

- Measure minimum instream flows as the 24-hour average of the flow (mean daily flow) and as an instantaneous flow, with instantaneous 15-minute stream flow as required by USGS standards at all gages.

- Measure and document all minimum instream flow releases in publicly available and readily accessible formats, and provide these data to USGS in an annual hydrology summary report.

- Within 1 year of license issuance, construct, operate, and maintain, after consultation with USGS, a water temperature and reservoir level gage in Philbrook reservoir with real-time capability.

- Provided there is safe access for PG&E employees to access project facilities at Philbrook reservoir, PG&E should make any necessary adjustments to the minimum instream flow release valve as quickly as possible, or within 2 hours, in response to heat-related events.

- As a result of annual consultation and adaptive management, construct, operate, and maintain up to three additional streamflow gages, upon Commission approval, if needed.

- Weather permitting, provide a roving operator to maintain and monitor the feeder diversions on a weekly basis.

- Develop, after consultation with Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and file for Commission approval, a water temperature monitoring plan, to be incorporated as part of the long-term project operations plan.

- Submit an annual report detailing temperature monitoring results to the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and the Commission prior to annual consultation.

- Include the Water Board and the Forest Service as members of the Operations Group.

- Monitor resident fish populations to evaluate their response to changes in project operations such as minimum flows.

- Monitor benthic macroinvertebrate populations to evaluate their response to changes in project operations such as minimum flows.

- Annually monitor anadromous fish and their designated critical habitats in Butte Creek.

- Develop and implement an adaptive management program to guide the long-term operations of the project to protect the federally listed anadromous fish within Butte Creek that considers the aquatic resources of the West Branch Feather River.

- Develop and implement a fish screen and passage plan for the Hendricks diversion dam that allows for additional flows needed to operate a fish ladder and provide passage to be reallocated to lower Butte Creek to protect listed ESA anadromous fish and designated critical habitat, if deemed appropriate by the Operations Group.

**Terrestrial Resources**

- Monitor foothill yellow-legged frog populations on both the West Fork Feather River and Butte Creek annually for the first 4 years and every 5 years thereafter.

- Expand annual review of special status species to include federally listed species and BLM sensitive/watch list species.

- Provide a summary report of animal mortality every 5 years with recommendations for additional protection measures as needed.

- Extend the vegetation management plan and invasive weed management plan to include non-Forest Service lands within the project boundary where access is available.

- Conduct surveys for bald eagle nesting every 3 years, and prepare a management plan if nesting is detected; increase frequency of surveys if use increases or management activities change.

**Recreational Resources**

- Extend concrete boat launch at Philbrook reservoir.

- Upgrade and maintain user-created trail and parking along Toadtown canal.

- Construct and maintain pathways from three Forest Service public parking areas to the southeast shoreline of Philbrook reservoir.

- Develop and implement a fish stocking plan for project reservoirs and reaches after consultation with Cal Fish & Game.

- Develop recreation use monitoring, reporting, and use triggers to periodically monitor changes in recreation use patterns at the project.

**Land Use and Aesthetic Resources**

- Develop and implement a fire management and response plan to prevent and handle potential fires at the project.

- Develop and implement a plan to monitor the aesthetic value of the DeSabla forebay for 1 year following installation of the temperature reduction device.

- Bring West Branch Feather River road crossing (designated as BW45 road) into the project boundary.

## 2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITIONS

Of the Forest Service's and BLM's preliminary 4(e) conditions (described in section 2.2.4) we include in the staff alternative 15 conditions as specified, 12 from the Forest Service and 3 from BLM; modify four of the Forest Service conditions to adjust the scope of the measures; and do not recommend three conditions, two from the Forest Service and one from BLM. The measures we modify or do not adopt in total are discussed in more detail in sections 5.2 and 5.4. However, we recognize that the Commission is required to include valid section 4(e) conditions in any license issued for the project.

Under this alternative, each of the measure that staff recommends be modified or does not recommend at all would be added to the staff alternative. Incorporation of these mandatory conditions into a new license would cause us to modify or eliminate some of the environmental measures that we include in the staff alternative. Our recommendations for water temperature and aquatic biota monitoring in the West Branch Feather River, minimum instream flows at Hendricks's diversion dam, fish screens and ladder at the Hendricks diversion dam, and recreational facilities on National Forest System lands would no longer be necessary given the Forest Service provides a counter part measure in its 4(e) conditions to our recommended measure.

In addition, this alternative would include the following measures: (1) funding for law enforcement and trout monitoring in the vicinity of the Hendricks diversion dam; and (2) the construction of three pipes in Hendricks/Toadtown canal to deliver minimum instream flows into Long Ravine, Cunningham Ravine, and Little West Fork creeks. Proposed and recommended measures are discussed under the appropriate resource sections and summarized in section 4 of this final EA.

We note in section 5.4, that the Forest Service may amend its modified section 4(e) conditions to be consistent with our recommendations that address aquatic resources on the West Branch Feather River as a result of the 10(j) process.[22]

## 2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

We considered several alternatives to the applicant's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. The alternatives considered are: (1) issuing a non-power license; (2) federal government takeover of the project; (3) the Conservation Groups' recommended alternative; and (4) retiring the project.

### 2.5.1 Issuing a Non-power License

A nonpower license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a nonpower license and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider issuing a nonpower license a realistic alternative to relicensing in this circumstance.

### 2.5.2 Federal Government Takeover of the Project

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. While that fact alone wouldn't preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

### 2.5.3 Conservation Groups' Alternative

In their joint letter filed on June 27, 2008, the California Sportfishing Protection Alliance, Friends of Butte Creek, Friends of the River, and American Whitewater, (collectively the Conservation Groups), recommended a set of environmental measures and requested that they be evaluated by the Commission as a complete and formal alternative in its NEPA analysis. The Conservation Groups' recommended measures would entail: (1) the optimization of anadromous fishery resources, water quality and quantity; (2) the prevention of widespread pre-spawn mortality to sensitive populations of

[22] *See* Forest Service's letter filed on June 11, 2009.

federally listed salmon; (3) the optimization of rearing habitat for federally listed juvenile steelhead; and (4) provision of reasonable recreational opportunities. Additionally, the Conservation Group's recommended measures may include the phased-in decommissioning of the Centerville powerhouse, Lower Centerville canal, and Lower Centerville diversion dam. As discussed in this final EA, the existence of the project's diversion dams and canal system allow for the conveyance of needed cold water from the West Branch Feather River to lower Butte Creek and the expedited delivery of cold water from upper Butte Creek to lower Butte Creek to support federally listed anadromous salmonid populations.

Because it contemplates dam removal, Conservation Groups set of recommended measures is not a reasonable alternative to relicensing the project with appropriate protection, mitigation, and enhancement measures.[23] We do, however, analyze each of the individual measures of their recommended alternative within the appropriate resource areas of this EA.

### 2.5.4 Retiring the Project

Project retirement could be accomplished with or without removal of the dams. Either alterative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. Again, because the existence of the project's diversion dams and canal system allow for the conveyance of needed cold water from the West Branch Feather River to lower Butte Creek and the expedited deliver of cold water from upper Butte Creel to lower Butte Creek to support federally listed anadromous salmonid populations dam removal is not a reasonable alternative to relicensing the project with appropriate protection, mitigation and enhancement measures.

The second project retirement alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

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[23] The Conservation Groups' recommended alternative is not supported in its entirety by any resource agency, especially those with mandatory conditioning authority and/or authority under the FPA (Cal Fish & Game, NMFS, and FWS).

# 3.0 ENVIRONMENTAL ANALYSIS[24]

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative* of this final EA.

## 3.1 GENERAL SETTING

The project is located in northern California in the Butte Creek and West Branch Feather River drainage basins. Both drainages are located in Butte County along the western slopes of the Sierra Nevada and Cascade Range geomorphic provinces. Butte Creek originates in the Jonesville Basin, Lassen National Forest, at an elevation of 7,087 feet[25] and flows southwesterly to its confluence with the Sacramento River at Butte Slough and Sacramento Slough near the town of Colusa, as shown in figure 1-1. The river originates in an area east of Round Valley reservoir, at an elevation of just over 6,960 feet, and flows southwesterly before draining into Lake Oroville.

Butte County is divided into six broad hydrologic regions, or water inventory groups, that were developed on the basis of hydrologic basins and common water sources. These hydrologic regions are named as follows: Mountain, Foothill, Vina, West Butte, East Butte, and North Yuba. The six hydrologic regions are shown in figure 3-1.

The Mountain Region comprises the easternmost area of Butte County, with elevations ranging from approximately 300 feet at the southernmost boundary of Butte County near the confluence of Honcutt and Wilson creeks to over 7,000 feet in the northeastern part of the county at Humboldt Peak (Butte County, 2008). The Foothill Region of Butte County lies between the Valley and Mountain regions, and ranges in elevation from approximately 200 feet at the base of the Campbell Hills on the margin of the Sacramento Valley to approximately 4,100 feet north of Stirling City, where it merges into the Mountain Region (Butte County, 2008). The Vina, West Butte, East Butte, and

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[24] Unless noted otherwise, the sources of our information are the license application (PG&E, 2007) and additional information filed by PG&E (2007a and 2008).

[25] Elevations are USGS datum.

North Yuba regions are located at low elevations in the Sacramento Valley portion of Butte County.

Within the overall Butte Creek and West Branch Feather River drainage basins, there are two areas that are specifically related to the project. These areas are referred to herein as the "project's Butte Creek drainage basin" and the "project's West Branch Feather River drainage basin." The project's Butte Creek drainage basin is defined as the sub-watershed area that includes the headwaters of Butte Creek and all project-affected reaches from the Butte Creek diversion dam down to the Parrott-Phelan diversion dam. The project's West Branch Feather River drainage basin includes the headwaters of the West Branch Feather River and all project-affected reaches from the Round Valley reservoir down to the Miocene diversion dam. In addition to these definitions, the term "project drainage basins" is also used in this document to collectively refer to the project's Butte Creek and West Branch Feather River drainage basins.

The project drainage basins span the two hydrologic regions of Butte County known as the Foothill and Mountain regions. Below the Mountain and Foothill regions and below the project drainage basins lies the Sacramento Valley area of Butte County, which includes the four hydrologic regions known as the Vina, West Butte, East Butte, and North Yuba regions (Butte County, 2008). These valley regions are located to the west-southwest and downstream of the project drainage basins, as shown in figure 3-1.

The project's Butte Creek drainage basin is an area of 96,012 acres that includes 41.5 miles of Butte Creek. The project's West Branch Feather River drainage basin is an area of 70,003 acres that includes 39 miles of the West Branch Feather River. The total drainage area of the combined project drainage basins is 166,015 acres. Water in the project drainage basins is supplied by fall and winter rain in the lower elevations, and spring and early summer snowmelt from the higher elevations of the basins.

Within the project drainage basins lies the "project area." The project area is defined as the zone of potential, reasonably direct impact, typically extending 0 to 100 feet from the project boundary and including Butte Creek from Butte Creek diversion dam down to, but not including, Parrott-Phelan diversion dam, and West Branch Feather River from Round Valley reservoir down to, but not including, Miocene diversion dam. The project area within the project's Butte Creek drainage basin is located almost entirely in the Foothill Region. The project area within the project's West Branch Feather River drainage basin extends from the Mountain Region down to the Foothill Region. The locations of project facilities are shown in figure 1-2.

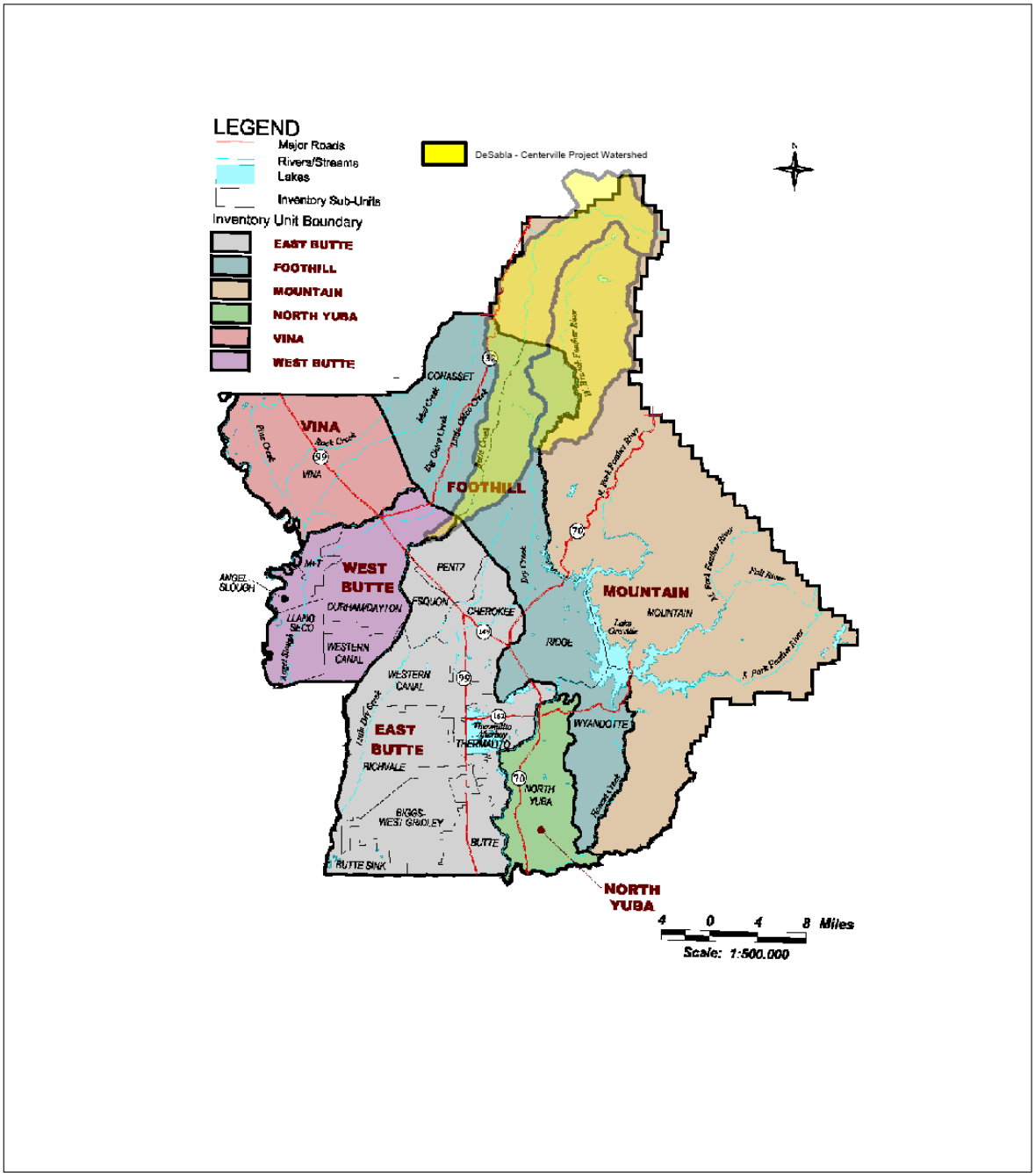


Figure 3-1. Butte County's six hydraulic regions. (Source: PG&E, 2004).

The project has three powerhouses supplied by water from three principle diversions within the project drainage basins, as well as eight smaller feeder diversions situated along the tributaries to Butte Creek (four of which are not in use) and three feeder diversions along the tributaries to the West Branch Feather River. Three non-project diversions (Forks of Butte, Miocene, and Parrott-Phelan) and one non-project powerhouse (Forks of Butte) also exist within the project vicinity.

## 3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing NEPA (40 CFR, §1508.7), cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts 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.

Based on our review of the license application and agency and public comments, we have identified water quality and quantity, and fisheries, including the federally listed Central Valley spring-run Chinook salmon and Central Valley steelhead trout (steelhead), as having potential to be cumulatively affected by the project in combination with other past, present, and future activities.

### 3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effects on the resources. In this case, each of the resource that may be cumulatively affected by the proposed action share the same geographic scope. We have defined that scope as follows: (1) Butte Creek from the headwaters to, but not including, Parrot-Phelan diversion dam including tributary streams to Butte Creek that currently are or historically have been diverted for the project; and (2) the West Branch Feather River from its headwaters to, but not including, the Miocene diversion dam including tributary streams to the West Branch Feather River that currently are or historically have been diverted for the project.

### 3.2.2 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on water, fishery, and recreational resources. Based on the term of the proposed license, we will look 30 to 50 years into the future, concentrating on the effects on water quantity and quality, and spring-run Chinook salmon and Central Valley steelhead from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information. We

identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

## 3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this final EA. Based on this, we have determined that water quality and quantity, aquatic, geologic, terrestrial, threatened and endangered species, recreation, land use/aesthetics, and cultural, resources may be affected by the proposed action and action alternatives. We present our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

### 3.3.1 Geologic and Soil Resources

#### 3.3.1.1 Affected Environment

**General Geology of Butte County**

According to Butte County's Seismic Element Plan in its County General Plan, Butte County includes portions of three major physiographic provinces. The western one-third of the county is in the Sacramento Valley province, which is underlain by sedimentary rocks 15,000 feet thick, with 100 to 200 feet of recent sediment overlying the rocks (Tertiary Formations). The eastern two-thirds of the county is in the Sierra Nevada province and is underlain by igneous and metamorphic rocks.

The portion of the county near Jonesville and Inskip lies partly in the Cascade Range physiographic province. The Cascade Range province is represented by a chain of volcanic cones where there are extrusive volcanic flows and pyroclastic sediments along with mudflows of volcanic and pyroclastic origin.

Sacramento Valley Province: The Sacramento Valley is a nearly level alluvial plain, separated geologically from the San Joaquin Valley by a buried northeast-trending fault in the vicinity of Stockton. On the north, the valley terminates at the Klamath Mountain foothills. The valley is drained by the Sacramento River, which passes through flood basins that include the Butte Basin west of Oroville. Both natural and man-made levies border the Sacramento River through much of the lowlands.

Recent alluvium underlying the greater part of the valley intermingles with numerous stream deposits of silt, sand, and gravel which were deposited by streams from

the hills to the east. These recent deposits consist mainly of reddish, sandy clay and black humus topsoil overlying unconsolidated sand, silt, clay, and gravel. The valley alluvium deposits increase in thickness from east to west, ranging from only a few inches along the foothills to more than 200 feet near the Sacramento River. The ground-water table is commonly high (within 10 feet of the surface) throughout the lowlands.

Pleistocene deposits of poorly consolidated, deeply red stained gravel, sand, silt, and clay are found as terraces along many of the stream channels near the eastern edge of the valley. The terraces were apparently formed as ancient flood plains of the Feather River and other streams during glacial periods.

Sierra Nevada Province: The Sierra Nevada is a westward tilted fault block of great magnitude. The block has a high, multiple-fault scarp face on the east front and a gentle, fault-bound west front which disappears under the sediments of the Sacramento Valley. The bedrock of the Sierra Nevada province consists commonly of Paleozoic and Mesozoic metasediments and volcanics intruded by a Mesozoic granitic batholith. The Sierra Nevada Mountains form the major portion of the eastern half of Butte County.

Along the western slope of the Sierra Nevada range, Tertiary sediments, volcanics, and isolated areas of upper Cretaceous sediments of the Sierra Nevada foothills dip westward beneath the Sacramento Valley. The Sierra Nevada Range terminates abruptly in the north where it disappears beneath the younger Cenozoic volcanic rocks of the Cascade Range. Highly metamorphosed sedimentary and igneous rocks lie along the west and northern edges of the Sierra Nevada.

In Butte County the western foothills of the Sierra Nevada gradually merge into the Sacramento Valley. The foothills are comprised commonly of younger Tertiary sediments, extrusive flows, volcanic mudflow material, and old alluvial sediments. One of the dominant features of the foothills is the Tuscan monocline, a flexing of surface rocks which trends northwest between Chico and Red Bluff. The average dip of the surface east of this line of flexure is 2-3 degrees. West of this line, the dip changes and averages from 5 to 9 degrees, continuing at this angle until the surface rock penetrates the valley alluvium. The Tuscan monocline is a linear feature similar to that of a fault.

Cascade Range Province: The Cascade Range extends from Washington to northern Butte County. Mount Lassen, one of the few active volcanoes in the continental United States, lies within this province approximately 23 miles north of the County. Late Cenozoic extrusive volcanic rocks comprise the mass of the Cascades. In Butte County, these rocks overlie portions of the sediments of the Sacramento Valley and the rock of the Sierra Nevada.

**Project Area Geology**

The project is located on the western slope of the Sierra Nevada, at the northern limit of the Sierra Nevada Geomorphic Province at its interface with the Cascade Geomorphic Province. The general project area may therefore be considered as transitional between the Sierra Nevada and Cascade Geomorphic Provinces. The Cascade Range is composed of a chain of volcanoes extending from northern California to southern British Columbia. The nearest Cascade volcanic center is Lassen Peak, located about 50 miles north of the project. Basement rock underlying the project area consists of Pre-Cretaccous metasedimentary and metavolcanic rocks. These rocks were subsequently intruded during the Cretaccous and early Cenozoic by granite plutons of the Sierran batholith. A sequence of late Cretaceous and early Cenozoic sedimentary and volcanic rocks, termed the Superjacent Series, unconformably overlies the metamorphic and plutonic basement. The Superjacent Series in the project area consists of unmetamorphosed Pliocene Tuscan Formation rocks and other older formations that are locally faulted and warped into a monoclinal fold known as the Chico Monocline, which is believed to be the surface expression of a suspected buried fault. The monocline trends northwest and dips southwest towards the Sacramento Valley. Folding was accomplished by extensive fracturing and faulting.

The late Cenozoic uplift and resulting westward tilt of the Sierra Nevada has produced a series of westward-flowing drainages that are deeply incised through the Cenozoic cover rocks, exposing the older metamorphic and sedimentary rocks below. These processes have resulted in steep slope in many portions of the project area. The project area ranges in elevation from approximately 270 feet to 5,651 feet; from Round Valley and Philbrook reservoirs at the upper extent, and down to the point where the lowest project-affected reach of Butte Creek enters the impoundment above the Parrot-Phelan diversion dam (a non-project facility).

The geology is varied and complex across this span of elevation. At the upper elevations of the project near Round Valley and Philbrook reservoirs, the local geology includes Pliocene and older Tertiary volcanic rocks, which are generally masked by Pleistocene glacial moraine deposits. The moraine deposits are composed of a heterogeneous mixture of volcanic boulders, cobbles, and gravel set in a dense matrix of clay and silt.

At mid elevations of the project, such as the vicinity of Butte Creek canal and DeSabla powerhouse, bedrock is primarily composed of Mesozoic to Paleozoic metavolcanic rocks with a few isolated blocks of metasedimentary rock. The foliation and bedrock structure follow a northwest to southeast trend, which parallels that of the Chico monocline and the Paradise-Magalia-Cohasset Ridge Fault Zone. The area is capped by extensive remnants of volcanic sedimentary rocks of the late Cenozoic (Pliocene) Tuscan Formation that overly the metamorphic rocks. The Tuscan Formation

is the predominant geologic unit, covering all other geologic formations and effectively caps the landscape in the mid-section of the Butte Creek watershed. The Tuscan Formation consists of thickly bedded lahars (volcanic mudflow deposits), fluvial volcanic conglomerate, volcanic sandstone and siltstone, with individuals beds ranging in thickness from about 3 feet to over 50 feet. Individual lahar beds commonly form steep cliffs in the Butte Creek canyons.

At lower project elevations, the Sierran Basement units are overlain by geologic units ranging in age from Quaternary to Cretaceous. Heterogeneous deposits of colluvium cover the slopes. The valleys contain coarse alluvial deposits of the Modesto Formation, consisting mostly of unconsolidated gravel, sand, silt and clay derived from the Tuscan Formation. The Tuscan Formation, the Magalia Channel Deposits, and the Chico Formation, a cretaceous fossiliferous marine sandstone, all lie underneath the Modesto Formation.

**Project Area Soils**

Soil types in the project area vary according to geology, elevation, and climate. In the upper project elevations, near Round Valley and Philbrook reservoirs, the soil type is generally characterized as stony sandy loam and gravelly or cobble sandy loams. The erosion hazard rating for most of these soils is moderate. In the mid-elevations of the project, from Hendricks diversion dam to Toadtown powerhouse, soil types range from loam to coarse sandy loam and gravelly sandy loam. In the lower elevations of the project, including DeSabla forebay and powerhouse and Lower Centerville canal and Centerville powerhouse, soil types vary from loam to gravelly loam and very stony loam.

Slopes are relatively gentle in the upper elevations of the project area near Round Valley and Philbrook reservoirs, become generally steep in the deeply incised stream channels in mid-elevation areas and generally level-out to form relatively gentle profiles in the lower elevations of the project area where Butte Creek approaches the Sacramento Valley. Landslides have occurred in the Butte Creek canyon before and after the development of the project due to the combination of steep slopes, episodic high rainfall events, and geologic conditions. The geomorphic processes that have shaped the project drainages, particularly landslides in the steep-sloping canyons, are described below. Butte Creek and the West Branch Feather River have deeply incised canyons. Along the mid-elevation areas, Butte Creek and other streams are still actively eroding and downcutting without significant deposition of alluvium along these relatively steep channel reaches. The upper canyon side slopes are undergoing continual modification by mass wasting (landsliding, erosion, and soil creep). Some large, deep-seated ancient landslides involving bedrock units have occurred in the canyon walls, both upstream and downstream of Centerville powerhouse. These larger landslides appear to have formed thousands of years ago, based on the amount of surface modification by erosion, soil

development, degree of vegetation establishment, and a lack of geomorphic evidence of recent sliding.

Roads and structures located on the ancient slide masses do not exhibit evidence of recent largescale movements. The ancient landslides most likely developed during the Late Pleistocene to mid-Holocene, when the region probably experienced a much higher average annual rainfall than in the present, and have reached a relatively stable configuration under the current climatic conditions. It is also possible that the ancient slides were initiated by prehistoric large magnitude earthquakes. Two large ancient landslides, in the vicinity of Centerville powerhouse, involved large transported blocks of Tuscan Formation, which appear to have failed at or above the contact with the underlying Magalia Channel deposits or Chico Formation bedrock. The toe of the ancient slide located north of the Centerville powerhouse site appears to have deflected Butte Creek, and overlaps Modesto Formation deposits estimated between 10,000 and 14,000 years old. The canyon slope above the powerhouse site does not appear to have been affected by ancient, large-scale sliding.

Some smaller, old slides, more recent in age than the large ancient slides, have developed in the canyon slopes, often within or along the edges of the ancient landslide masses. These features are estimated to be on the order of many tens to hundreds of years old, and are not currently active. These old slide masses have been somewhat modified by erosion, but their geomorphic expression is generally more pronounced than that of the ancient slides. Trees have become established on the older slide masses, suggesting a relatively long period of quiescence.

Shallow recent and active landslides and debris flows that have failed within the last several decades have been identified in the project vicinity. One such slope failure appears to have occurred during the winter of 1982-83 and/or 1986, periods during which the region experienced very high, sustained rainfall. These recent/active failures are generally shallow and involve weathered bedrock and surficial deposits. Other shallow slides and erosion gullies have been observed in the area of project facilities. These slides have formed in the surficial mantle of colluvium, soil, or terrace deposits, and are therefore shallow. They have largely formed where the surficial soil/colluvium has been saturated by concentrated runoff, or undermined by erosion.

**Reservoir Shoreline and Streambank Conditions**

There are two project storage reservoirs: Round Valley and Philbrook. Both reservoirs have limited storage capacity. Round Valley reservoir has a capacity of 1,196 acre-feet, and Philbrook reservoir has a capacity of 5,009 acre-feet. Along with limited reservoir storage capacity, the project has canal-flume flow capacities up to 125 cfs. Given the low canal-flume flow capacities relative to stream flows in Butte Creek and the West Branch Feather River, especially during higher flow periods such as during flood

events and/or snowmelt, the project operates as a run-of-river system, with most of the stream flow remaining instream during medium to high flow periods; hence, project impacts to streambanks are minimal.

The upper storage reservoir, Round Valley reservoir, is formed by Round Valley dam and is located on the West Branch Feather River. Round Valley reservoir has a total drainage area of 2.25 square miles, a surface area of 98 acres and shoreline length is 10,050 feet at maximum water surface elevation of 5,651.1 feet. The maximum depth of Round Valley reservoir is about 25 feet. Water releases from the reservoir are made through a manually operated low-level outlet valve at the upstream end of the outlet pipe at the base of the dam. It discharges to the natural channel of the West Branch Feather River. Shoreline conditions at Round Valley reservoir are mostly stable. Shoreline slopes are low and the stony sandy loam soils are in part protected by a lag of gravel that has developed since construction of the Round Valley dam in 1877. Vegetation above the high-water line is undisturbed. There is no boating access at Round Valley reservoir so the shoreline is not affected by erosion from boat wakes.

However, some forces at Round Valley reservoir have the potential to cause adverse effects on historic properties. These include wind-generated wave action, the seasonal drawdown of the reservoir, and, to a lesser extent, natural erosion. These forces can remove or displace the soil matrix along the shoreline, resulting in artifact displacement, deflation of the cultural deposit, compression of multiple occupational components into a single undifferentiated deposit, obliteration of stratigraphic relationships and contextual associations, leaching or decomposition of organic remains, and other effects. Additional disturbances include off-road vehicle activity and casual artifact collecting that occur seasonally when water levels are low. These forces may further disturb, dislocate, damage, or remove cultural deposits and artifacts, resulting in artifact breakage, loss of artifact and feature associations, and destruction of or damage to stratigraphic relationships and contextual associations.

The lower storage reservoir, Philbrook reservoir, is formed by Philbrook dam and is located on Philbrook Creek, approximately 3 miles south of Round Valley reservoir. Philbrook reservoir has a total drainage area of 5.0 square miles, a surface area of 173 acres and shoreline length of 15,753 feet at maximum water surface elevation of 5,552.5 feet. Philbrook reservoir has a maximum depth of about 60 feet. Water releases from Philbrook dam are controlled by a manually-operated, 30 inch-diameter needle valve at the downstream end of the pipe. The valve is frequently adjusted. It discharges water to the natural channel of Philbrook Creek. Maximum discharge capacity is about 72 cfs.

Shoreline slopes are generally low and the coarse sandy loam soils are partly protected by a lag deposit of gravel soils that have developed since construction of the Philbrook dam in 1926. Vegetation above the high-water line is undisturbed except for minor disturbance near camping and picnic areas. Boating is allowed on Philbrook

reservoir but is primarily slow moving boats related to fishing and rowing; therefore, the shoreline is minimally affected by erosion from boat wakes. The shoreline may be affected by the seasonal drawdown of the reservoir; however, given the setting and use of this reservoir, the shoreline remains stable throughout the drawdown range of elevations because it is protected by a lag of gravel.

#### 3.3.1.2 Environmental Effects

**Project and Ancillary Road-Related Erosion**

PG&E conducted an Inventory and Assessment of Project and Ancillary Road-Related Erosion (Study 6.3.1-1) as part of its relicensing studies. The study concluded that, overall, the roads within the project boundary are in good condition. The roads are generally stable and do not pose significant erosion concerns, and most of the culverts have little potential for sediment transport to local streams and function without problems. There are, however, a number of localized road-related drainage areas identified in the road surveys that have erosion issues. These roads tend to be a source of sediment production due to their geologic and topographic setting, as they are areas with fine grained native sediments and relatively steep terrain (e.g., Burma Road, Clear Creek Road, Butte Creek Diversion Dam Road).

PG&E proposes improvements such as increased drainage controls (e.g., additional culverts or rolling dips) on several roads to reduce production of fine sediments, replacing a number of damaged and/or temporary culverts, installing velocity dissipators at culvert outlets; and improved management of side cast materials during annual road blading activities. These activities would minimize erosion and sediment transport potential during future project operations and management.

PG&E also proposes to develop and implement a project transportation system management plan to be included as a condition of any new license issued. The plan will be approved by the Forest Service, for the protection and maintenance of roads associated with the project on National Forest System lands. PG&E, in consultation with the Forest Service, proposes to take appropriate measures to rehabilitate existing erosion damage and minimize further erosion of the project access roads located on National Forest System lands. The plan also calls for PG&E to install gates or other vehicle control measures where necessary to reduce or eliminate potential erosion resulting from on- or off-road vehicle use.

The transportation system management plan proposed by PG&E is consistent with plans recommended by FWS [FPA § 10(a) recommendation 1], NMFS [FPA § 4(e) recommendation 3], and the Forest Service [FPA § 4(e) condition 36] as they relate to geologic resources, erosion, and sedimentation control. The Forest Service's recommendation also includes the following erosion control elements:

- Remove or minimize sidecast; particular care shall be taken near streams and channel crossings;

- Outslope roads where feasible and utilize long, gradual rolling dips to disperse runoff;

- When roads are insloped, use sufficient drainage structures to minimize runoff in inside ditches;

- Disconnect road sediment sources to watercourses and incorporate erosion control measures by/through the use of rolling dips, waterbars, filter strips, cross-drains, etc.;

- Address need for increased frequency of cross-drains, waterbars, and/or rolling dips;

- Where berms and through-cuts have been created, lead outs shall be installed, where feasible, to minimize concentrated flow and allow road drainage from waterbars or other structures; and

- Treat potential erosion or mass wasting sites (removal of fill, or erosion control implementation).

This plan, as it pertains to road use and maintenance, is further discussed in section 3.3.6, *Land Use and Aesthetic Resources*.

*Our Analysis*

Continued project operations and management has the potential to create hard-surface runoff and drainage from project roads and ancillary roads, thus potentially increasing erosion and associated sediment transport to the mainstem stream channels of Butte Creek, the West Branch Feather River, and their primary tributaries. Implementation of the above PG&E-proposed improvements as well as the inclusion of a project transportation system management Plan, as proposed by PG&E and recommended by FWS, NMFS, and the Forest Service, in any license issued will result in reducing erosion to minimal levels.

**Round Valley Reservoir Spillway-related Erosion and Sediment Transport**

According to the Round Valley Reservoir Spillway-Related Erosion and Sediment Transport Survey (Study 6.3.1-2) conducted by PG&E as part of its relicensing studies, observation of the West Branch Feather River indicates that it has not been affected by sediment input from the Round Valley spillway. The rock underlying the spillway channel is relatively hard and indurated, and resistant to erosion. Some alluvial debris

has accumulated at the mouth of the spillway channel north of the channel of the West Branch Feather River. It is likely that other materials eroded from the channel over the past 130 years have been carried away down the West Branch Feather River.

PG&E proposes to armor the plunge pool with rip rap and place warning signs to keep visitors away from the steep plunge pool slopes as a means to reduce sediment input to the spillway and also to improve safety. These high banks are steep and located close to the parking area on the west end of the dam. This proposed work would also help protect the downstream end of the concrete spillway apron from being undermined in the future. If the plunge pool slopes are laid back, off-highway vehicles may begin to enter this area and cause future erosion. If earthwork is performed along the spillway, additional sediment will likely be generated during the initial spillway flows at the start of the following winter season due to the ground disturbance.

PG&E also proposes to develop a Round Valley dam spillway stabilization plan to be included as a condition of any new license issued. The plan shall include at a minimum: (1) an assessment of areas to be stabilized; (2) feasibility-level design drawings for stabilization measures; and (3) a schedule for implementation of the measures. PG&E plans to provide a draft plan to the Forest Service and the Water Board for review and file the plan including evidence of consultation with the Commission.

The Round Valley dam spillway stabilization plan proposed by PG&E is consistent with the plan recommended by the Forest Service (FPA §4(e) condition 21). The Forest Service's recommendation also includes the following elements:

- Within 6 months of license issuance, the licensee shall conduct a minimum of one field reconnaissance/design meeting jointly with the Forest Service and other mandatory conditioning agencies and develop, for Forest Service approval, construction level designs needed to implement several geologic concepts;

- Within 1 year of license issuance, the licensee shall complete implementation of Forest Service approved designs that address the above concepts;

- Monitor mitigation measures above, annually for the first 3 years following completion. If any mitigations are not providing adequate resource protection, consult with the Forest Service to develop alternative mitigations and implement Forest Service approved mitigations; and

- Monitor the entire spill channel every 5 years, or following a 10 year plus flood event, for the life of the license. Consult with the Forest Service if erosion is occurring, to develop and implement Forest Service approved mitigations.

*Our Analysis*

Continued project operation and management has the potential to result in erosion from the Round Valley dam spillway channel and sediment transport to the West Branch Feather River, although in its current geomorphic condition, the spillway channel is not expected to be a significant source of future erosion and sediment transport to the West Branch Feather River. The inclusion of a Round Valley dam spillway stabilization plan, as proposed by PG&E and recommended by the Forest Service, in any license issued will ensure the clear identification of the reaches of the channel that are most likely to be a future source of erosion and subsequent sediment transport to the West Branch Feather River and the development of plans for stabilizing such areas of the spillway channel to minimize future erosion and sediment transport on the National Forest System lands. The Round Valley dam spillway stabilization plan should be filed for Commission approval.

**Philbrook Spillway Channel Stabilization**

Studies and surveys pertaining to the Philbrook spillway channel were originally included in PG&E's Pre-Application Document under a study called Reservoir Spillway-Related Erosion & Sediment Transport. Shortly before the relicensing site visit which occurred on June 20, 2005, a significant head cut, also known as the knickpoint, was discovered in the Philbrook spillway channel on National Forest System lands, outside the FERC project boundary. Due to the level of concern expressed by agencies specifically on the head cut portion of this study and the coincidental scheduling of the Part 12 Philbrook dam 5 year safety inspection for July 26, 2005, it was decided, at a July 8, 2005, relicensing meeting amongst stakeholders, to discuss mitigation of this project-induced effect as a component of the Part 12 Process. However, during the July 26, 2005, inspection, dam safety participants and the Commission's Division of Dam Safety and Inspections did not feel that the Part 12 process was the appropriate venue to resolve the issues associated with the Philbrook spill channel since the head cut did not pose an imminent threat to the integrity of Philbrook dam. Discussions at the field meeting centered on use of both/either the existing license conditions as well as the relicensing process to resolve this issue.

In his August 17, 2005, Study Plan Determination for the project, the Director of the Commission's Office of Energy Projects noted that this Philbrook reservoir erosion problem was currently under review by the Division of Dam Safety and Inspections' San Francisco Regional Office (Regional Office) and referred the Forest Service's comments on PG&E's revised study plans to the Regional Office so they could be addressed under the current license. Additionally, PG&E was required to consult with Forest Service in this process. However, if the Forest Service was not satisfied with the Regional Office's decision, the Forest Service could request study modification under this relicensing proceeding, pursuant to §5.15 of the regulations.

In a September 27, 2005, letter to the Regional Office, PG&E attached a proposed plan and schedule to investigate and potentially remediate the 3,000 foot-long spillway channel below the Philbrook dam. The plan addressed the concerns of the Forest Service. Some site investigations were proposed for the fall of 2005 with the majority of the investigation and engineering to take place during 2006. PG&E stated that remediation work would take place after permits and environmental review processes were complete, most likely in 2007.

In a letter filed on October 2, 2007, PG&E provided the Commission with a status report on follow-up items from the project inspection held on July 9 to 12, 2007. The letter stated that PG&E provided the Forest Service with a report containing potential remediation options and met on September 27, 2007, to discuss these options. The Forest Service provided several comments and PG&E would develop a final project description by fall 2007. The proposed work would require the disposal of spoil material and the potential development of a borrow site for rip-rap material. PG&E stated that a process was underway to identify possible sites. It planned to work as quickly as possible to complete the project description and prepare documents for the required permits. PG&E further stated that it was possible that the time required for generating this material and securing the permits may not allow sufficient time for completion of construction in 2008. Finally, PG&E stated that as the project description and schedule were finalized, it will be evaluating what work could be accomplished in 2008 and whether some activities would need to be scheduled for 2009.

PG&E filed another status report on April 24, 2008, which stated that it determined that a borrow site would be required to secure the rock necessary for remediation work on the Philbrook spill channel. PG&E and the Forest Service identified possible sources that were in the vicinity of the Philbrook reservoir, and during the spring and summer of 2008, would be conducting site exploration and environmental studies necessary to complete the project description. After this information is compiled, permit application would be completed. PG&E anticipated that no construction work, other than borrow area exploration, would be accomplished in 2008.

In its FPA §4(e) conditions (No. 22), the Forest Service recommends that PG&E implement the Philbrook spillway channel stabilization plan. The Forest Service's recommendation includes the following elements:

- Construct a ford or low water crossing on the project spill channel (accessing Philbrook gage below Philbrook dam) to Forest Service standards;

- Implement all actions, not already completed prior to license issuance, of the Philbrook spillway channel stabilization project plan, approved by the Forest Service. Implementation of this plan shall be complete by December 1, 2010, unless extended by the Forest Service;

- Monitor the entire spill channel every 5 years, or following a 10 year plus flood event, for the life of the license. Consult with the Forest Service if erosion is occurring to develop and implement Forest Service approved mitigations; and

- Monitor mitigation measures addressed in the final Forest Service approved Philbrook spillway channel stabilization project plan, annually for the first 3 years following completion, unless that plan stipulates more stringent monitoring. If any mitigations are not providing adequate resource protection, consult with the Forest Service to develop alternative mitigations and implement Forest Service approved mitigations.

*Our Analysis*

Based on the communications between PG&E and the Commission/Regional Office contained in the record for this project and the information provided by the Forest Service in its FPA §4(e) condition 22, we assume that the remediation and mitigation for the erosion occurring below the Philbrook spillway channel has not yet been completed. According to a Regional Office report, the erosion migration rate below the Philbrook spillway channel is a function of high discharge spillway events.

The inclusion of a Philbrook spillway channel stabilization plan, as recommended by the Forest Service, in any license issued will ensure that measures are taken to mitigate for the current erosion problem below the Philbrook spillway channel. The plan will also allow for routine monitoring to identify and address any future erosion problems that may arise. The plan should be filed for Commission approval and include a schedule for filing status reports with the Commission on the ongoing monitoring associated with erosion below the Philbrook spillway channel.

Since the current erosion problem, or knickpoint, is located on lands that are outside the project boundary, and the Philbrook spillway channel stabilization plan requires ongoing monitoring for the life of the license, we recommend that these lands, starting at the Philbrook spill channel, extending from the two Philbrook spillways, and ending at the confluence with Philbrook Creek, be brought into the project boundary.

**Canal Spillway-Related Erosion and Sediment Transport**

Results from PG&E's Canal Spillway-Related Erosion and Sediment Transport Survey (Study 6.3.1-3) indicate that half of the 24 channels had a low amount of sediment available to active channels and low risk of sediment being added to either the receiving stream or a mainstem channel. Five out of 24 had moderate sediment availability due to the channels having discontinuous erodible sections, with possible or intermittent transport of sediment to an active channel. Seven spillways were actively eroding. Of these seven, two had a large amount of sediment potentially available to an

active channel because of direct erosive action by the spilling. The other five had sediment available because they were created in drainages that had either unstable and erosive parent material or other actions in the basin initiated erosion (e.g., not directly related to spillway use but spillway use may have exacerbated the problem).

*Our Analysis*

In the project area, the mainstems of Butte Creek and the West Branch Feather River are generally transport reaches. Even though there are several spillways that are actively eroding and have the potential to add (and likely have added) sediment to Butte Creek or the West Branch Feather River, the effects of this added sediment on these mainstems may not be quantifiable. In the project area, Butte Creek and the West Branch Feather River are generally sediment supply-limited. Butte Creek substrate is very coarse, and dominated by bedrock and boulders. In the case of Butte Creek only, the gradient does not decrease sufficiently to allow more alluvial/depositional conditions until downstream of the Centerville powerhouse. West Branch Feather River has very few alluvial sections in the project area, and which reflects limited opportunities for storage of finer material. Because the storage of gravel and finer material is limited in the mainstems, a little gravel and sand that may be added by the spillways could be seen as positive.

**Project Canal Maintenance and Inspection**

The Water Conveyance Geologic Hazards Risk Assessment (Study 6.3.1-4) conducted by PG&E as part of its relicensing studies identified 428 geologic hazards and potential geologic hazards in 36.5 miles of water conveyance facilities, an average of 12 hazards per mile. The Butte Creek canal had the highest number of total hazards and the highest number of hazards per canal mile, followed by Lower Centerville, Hendricks, Upper Centerville, and Toadtown canals.

However, in terms of assigned risk of engineering and operational concerns, Butte Creek canal is virtually indistinguishable from the Lower Centerville canal, which might be expected given their similar geologic and geomorphic settings. Nearly half (48 percent) of the length of these canals was scored moderate or higher risk and 11 percent of each was assigned a score of moderately high or higher risk. The only significant distinction was that one approximately 200-foot-long section of the Butte Creek canal did receive a very high risk score. For comparison, the Hendricks canal received a moderate or higher score over 14 percent of its length and only 7 percent was given moderately high or higher score. Both the Upper Centerville and Toadtown canals received comparable but considerably lower overall risk assignments, again which might be expected given their similar geologic and geomorphic settings.

PG&E stated that past failures of project conveyances are attributable to two main causes: (1) geologic hazards (activation of rockslides and debris flows); and (2) hazard

trees (diseased, dead, or dying trees) that present a direct or indirect risk to the conveyances and appurtenant facilities. Project experience shows that most canal and flume failures have occurred during inclement weather and are typically associated with rockslides and hazard trees that breach the conveyance directly or that enter the project canal, obstruct flow, and result in overtopping of the berm.

Since the early 1990s, PG&E has been implementing best management practices that have substantially reduced, though not eliminated, the adverse effects of canal failures. The most effective measure has been to reduce water levels in the water conveyance facilities before and during storm events to increase available freeboard and reduce the risk of overtopping from a minor rockslide or hazard tree entering the canal. Regular aerial and ground patrols, periodic canal repairs and removal of hazard trees, and the abandonment of passively automatic siphonic spill equipment, have also proven beneficial in reducing risk.

PG&E proposes to develop a project canal maintenance and inspection plan to be included as a condition of any new license issued. The plan sets forth in detail PG&E's responsibility for the regular maintenance and inspection of project canals to address hazard trees and geologic hazards within the FERC project boundary that may impact the integrity of project water conveyances and includes the following elements:

- Annual inspections of the project water conveyance system to identify potential short-term and long-term hazards (e.g., hazard trees, landslides, etc.) and to prioritize maintenance and/or mitigation;

- Protocols for routine (non-emergency) canal operations and the use of canal spillways; and

- Stabilization measures to reduce the likelihood of catastrophic canal failure due to hazard trees and geologic hazards and to mitigate, as appropriate, sources of chronic erosion and sediment transport into canals.

The project canal maintenance and inspection plan proposed by PG&E is consistent with plans recommended by the Forest Service [FPA § 4(e) condition 23], NMFS [FPA § 10(j) condition 3], FWS [FPA § 10(j) condition 4], and Cal Fish & Game (Recommendation 7). Additionally, the Forest Service, FWS, and Cal Fish & Game recommend that the plan contain specific preventative measures to address geologic hazards identified in relicensing Study Plan 6.3.1-4, Water Conveyance Geologic Hazards and Risk Assessment.

This plan, as it pertains to water quality, is further discussed in section 3.3.2, *Aquatic Resources*.

*Our Analysis*

The continued operation of project water conveyances, particularly the Butte Creek and Lower Centerville canals, presents an ongoing risk of adverse environmental impacts on mainstem streams. The risk of erosion and sediment transport due to uncontrolled releases of water is an unavoidable consequence of the geographically remote and geologically unfavorable area in which project conveyances are located. Continuation of PG&E's best management practices and the inclusion of a project canal maintenance and inspection plan as proposed by PG&E and recommended by the Forest Service, NMFS, FWS, and Cal Fish & Game, in any license issued would ensure that hazard trees and geologic hazards, the two primary causes of past failure of project water conveyances, are identified and, in the most serious cases, mitigated. The plan would formalize existing non-emergency canal operations protocols and provide a consistent point of reference for routine canal operations while permitting PG&E the flexibility to operate the project in accordance with its best management practices. The plan would also address a possible range of options (operational and geotechnical) that could be considered for reducing risks of catastrophic failure that could come from hazard trees or geologic instability.

**Centerville Powerhouse Spillway Channel**

In a June 27, 2008 letter, the Conservation Groups requested that PG&E stabilize and remediate the spill channel located just above Centerville powerhouse, to avoid continuing and repeated incidents of turbidity in Butte Creek at and below the spill channel outflow. This channel spills with some frequency; in fact, when the smaller generating unit at Centerville powerhouse is operating, water is necessarily spilled into this channel because the head required to operate the turbine requires more water than the capacity of the turbine. The lower end of this channel has been gunited. However, the upper end is unlined and unstable, and sediment is spilled into Butte Creek when this channel operates, especially after a period of non-use. The bottom of this channel spills into that portion of Butte Creek on which resource agencies have explicitly placed greatest emphasis, since it is at the top of the reach where the greatest amount of spawning habitat is located, and where a substantial percentage of Spring-run Chinook salmon hold below thermal barrier. The Conservation Groups further stated that they have no cost estimate for remediating this channel. Relicensing participants were informed in meetings that the upper end of this channel is very unstable, and the effort needed to remediate would be financially significant and logistically challenging.

In its reply to comments, filed on August 14, 2008, PG&E stated that it conducted a study of the spill channel located above the Centerville powerhouse to develop recommendations for spill channel stabilization and to reduce turbidity effects as a result of spill channel operations. During 2005, PG&E implemented remediation measures recommended by the study and now considers that the spill channel is stable and

functioning well. PG&E states that, at this time, any further upgrades to the spill channel are unnecessary.

On May 28, 2009, the Conservation Groups filed, with the Commission, a presentation on erosion at the Centerville powerhouse spillway channel. The presentation contained information, including photographs, documenting the alleged erosion problems at the spillway channel.

*Our Analysis*

We have forwarded the Conservation Groups' submission to the Commission's Division of Dam Safety and Inspections for review under the current license. In the draft EA, we concluded that no further measures by PG&E, were necessary to stabilize or remediate the spill channel below the Centerville powerhouse. However, depending on the outcome of the Division of Dam Safety and Inspections' review, remediation of the spillway may be necessary.

**General Project-Related Erosion**

In its FPA §4(e) condition (No. 21), BLM recommends that PG&E, in consultation with BLM, shall:

- Fix and maintain all areas of the Butte Creek canal on or adjacent to BLM land that show signs of erosion deemed significant by BLM, and which BLM believes would lead to canal failure/blowouts and spills; and

- Reconstruct and maintain areas of Ditch Creek Road that are affected by project-caused erosion. This includes damage caused by any spills, blowouts, canal erosion, or seepage onto Ditch Creek Road.

*Our Analysis*

The inclusion of the measures, recommended by BLM, in any license issued will ensure that any lands impacted by project-related effects (damage caused by any spills, blowouts, canal erosion, or seepage onto Ditch Creek Road) will be mitigated for and will be maintained during the course of a new license. After consultation with BLM, PG&E should file a schedule with the Commission for completing these measures.

We discuss the cost of developing and implementing measures relating to erosion, sediment transport and control, and geologic hazards in section 4, *Developmental Analysis*. We present our final recommendations pertaining to erosion, sediment transport and control, and geologic hazards in section 5.2, *Comprehensive Development and Recommended Alternative*.

### 3.3.2 Aquatic Resources

#### 3.3.2.1 Affected Environment

**Water Quantity**

The project is located on the western slopes of the Sierra Nevada Mountain Range, and utilizes the flows of two drainage basins; Butte Creek to the west and the West Branch Feather River to the east (figures 1-2 and 1-3). The Butte Creek basin drains into the Sacramento River near Colusa, California and has no major lakes or reservoirs along its course. The Butte Creek basin ranges in elevation from approximately 7,100 feet above mean sea level (msl) at the headwaters to 475 msl at the Centerville powerhouse. The project's Butte Creek drainage basin is 150 square miles (96,012 acres) in area and encompasses 11 sub-basins extending from the headwaters of Butte Creek downstream to the non-project Parrott-Phelan diversion dam at Butte Creek river mile (RM) 46.2.

The project's 109 square mile (70,003 acre), West Branch Feather River drainage basin encompasses nine sub-basins and extends from the headwaters of the West Branch Feather River (upstream of Round Valley reservoir) downstream to the non-project Miocene diversion at West Branch Feather River RM 15.0 (figures 1-2 and 1-3). The West Branch Feather River flows into Lake Oroville which flows into the Sacramento River. The West Branch Feather River ranges in elevation from approximately 7,000 to 3,200 feet msl at the Hendricks diversion dam (also known as Hendricks Head dam). There are two reservoirs, Round Valley (also known as Snag Lake) and Philbrook reservoirs, located in the West Branch Feather River basin's headwaters, which are used to store winter runoff. Flow releases from these two reservoirs are made to supplement summer flows in the West Branch Feather River and in Butte Creek, via the interbasin transfer of water through project canals (see figure 1-2), as described below.

The project region experiences warm, dry summers and cool winters with significant snowfall in the higher elevations (above 5,000 feet msl) and extensive rain in the lower elevations. As measured at Paradise, California (elevation 1,778 feet msl), July air temperatures range from an average maximum high of 91.7°F to an average minimum low of 63.9°F, while January air temperatures range from an average maximum high of 53.7°F to an average minimum low of 37.6°F. The annual average maximum and minimum temperatures for Paradise, California, are 70.9°F and 49.5°F, respectively.

Rainfall and snowmelt are the major sources of water in the Butte Creek and West Branch Feather River watersheds and over 95 percent of the average annual precipitation in the project area occurs between October through May. Below 3,500 feet msl, rain is the dominant form of precipitation in the project area. However, between 3,500 and 5,500 feet msl, winter precipitation is mostly in the form of snow which, below 4,000 feet msl often melts between storms. Above elevations of 5,500 feet msl, the dominant form of precipitation is usually snow, with only occasional rain-on-snow below 6,500 feet msl

(Forest Service, 1998). Snowmelt occurs in late spring and early summer months, typically producing the largest stream flows during spring. By late summer, the stream flows are usually at their lowest levels as snowmelt has subsided.

The mean annual natural runoff for the portion of the Butte Creek drainage basin upstream of the Butte Creek diversion dam (also referred to as Butte Creek Head dam) based on analysis of a 50-year period from 1934 through 1983 is approximately 122,500 acre-feet. This is equivalent to about 38.3 inches/year of water over the drainage area of about 65 square miles. The mean annual natural runoff for the West Branch Feather River drainage basin at the non-project Miocene diversion dam is approximately 285,000 acre-feet with a drainage area of about 109 square miles. This is equivalent to about 49.5 inches/year of water over the drainage area.

There are no known groundwater aquifers within the existing project area (DWR, 2000). Where groundwater occurs, it is typically associated with the Tuscan Formation and is contained within the fractures and joints of volcanic mudflows, as well as in the weathered horizons between buried mudflows (Slade, 2000). The volcanic deposits and the inter-bedded stream deposits with which they are associated are readily infiltrated by precipitation because of their porosity and permeability. Although the deposits are not aquifers in the sense of being developed, they do provide water to springs and contribute to base flow in the area's streams. Seasonal groundwater of varying depth and continuity follows, in modified form, the contours of the land. However, summer base flows for both the Butte Creek and West Branch Feather River basins are relatively high during the late summer months, indicating a relatively abundant groundwater storage supply.

*Project Reservoirs*

Round Valley Reservoir – The highest elevation storage reservoir for the project is Round Valley reservoir, formed by Round Valley reservoir dam, located on the West Branch Feather River approximately 12 miles upstream from the Hendricks diversion dam (see figures 1-2 and 1-3). Round Valley reservoir has a total drainage area of 2.25 square miles, a surface area of 98 acres at a maximum water surface elevation of 5,651.1 feet msl, and a total usable capacity of 1,196 acre-feet. The maximum depth of Round Valley reservoir is 25 feet. Historic daily water surface elevations for Round Valley reservoir for the period of record (1986 to 2005) are shown in figure 3-2.

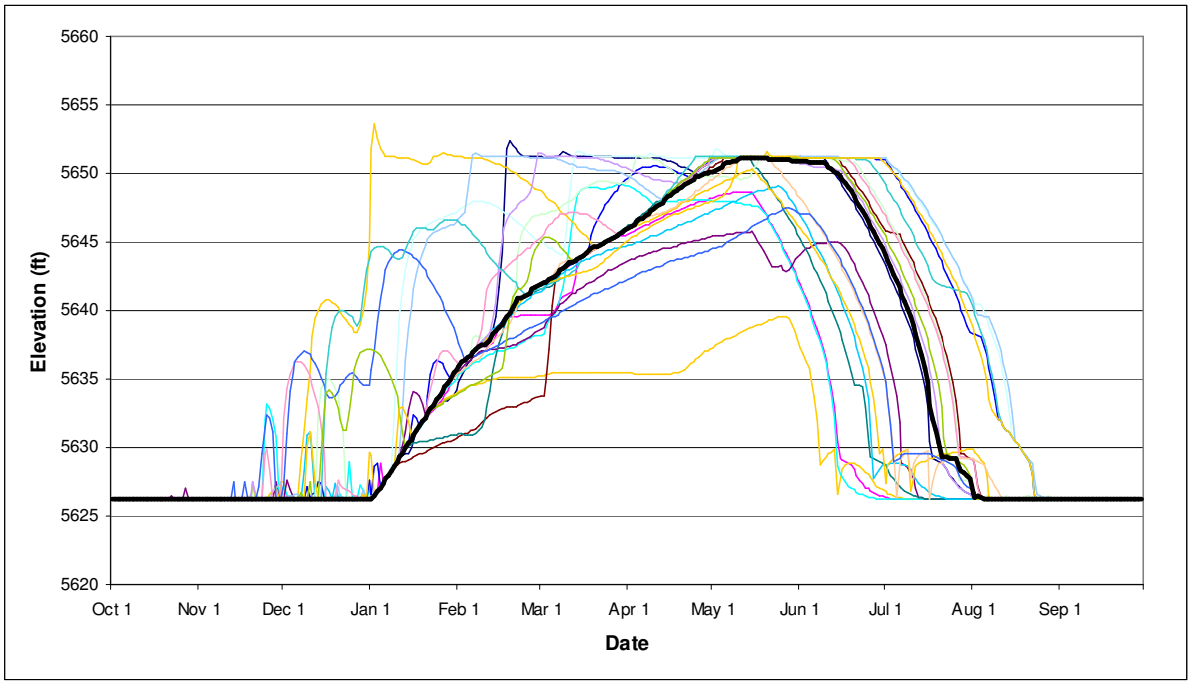


Figure 3-2. Round Valley reservoir water surface elevations during the period of record (1986 through 2005). The bold line represents the average water surface elevations for a particular date. (Source: PG&E, 2007a)

Under the 1983 Fish and Wildlife Agreement between PG&E and Cal Fish & Game, in normal water years, PG&E did not draft Round Valley reservoir until after July 15 for waterfowl habitat management. However, on August 21, 1997, the Commission issued an order placing a restriction on the release of water from Round Valley reservoir when the water temperature within the reservoir exceeded 17°C.[26] The Commission concluded that water released in excess of 17°C from Round Valley reservoir would warm by an additional 3°C before reaching the lower Centerville diversion dam, thus exceeding the 20°C goal for enhancing spring-run Chinook salmon habitat in lower Butte Creek. On August 20, 1998, to better allow for short-term operational flexibility to benefit spring-run Chinook salmon, the Commission revised its order to allow modification of the temperature criteria upon agreement of NMFS, Cal Fish & Game, and FWS.[27] Since 1999, this agreement has been accomplished through an annual Project Operations and Maintenance Plan, developed by PG&E in consultation with the agencies, which governs water releases from both Round Valley and Philbrook reservoirs.[28]

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[26] 80 FERC ¶ 62, 171 (1997).

[27] 84 FERC ¶ 62, 165 (1998).

[28] The annual Project Operations and Maintenance Plan is developed in consultation with NMFS, Cal Fish & Game, and FWS.

The annual Project Operations and Maintenance Plan has called for the release of water from Round Valley reservoir as soon as space is available for the water in Hendricks canal (see description below), which typically occurs in June. This action is designed to minimize the potential for water temperature increases in Round Valley reservoir as water temperatures increase later in the summer, and to preserve the cool water benefits of Philbrook reservoir. Once the water releases from Round Valley reservoir are initiated, the reservoir is completely drained in approximately 1 month's time, as shown in figure 3-2. Round Valley reservoir has no minimum storage requirement under the current license.

Philbrook Reservoir – Philbrook reservoir is formed by Philbrook dam and is located on Philbrook Creek, approximately 3 miles south of Round Valley reservoir (see figure 1-3). Philbrook Creek discharges into the West Branch Feather River about 2 miles downstream of Philbrook dam. Philbrook reservoir has a total drainage area of 5 square miles, a surface area of 173 acres at a maximum water surface elevation of 5,552.5 feet msl, and a total usable capacity of 5,009 acre-feet. The maximum depth of Philbrook reservoir is 60 feet. The current license requires a minimum pool of no less than 250 acre-feet in Philbrook reservoir. Historic daily water surface elevations for Philbrook reservoir for the period of record (1986 to 2005) are shown in figure 3-3.

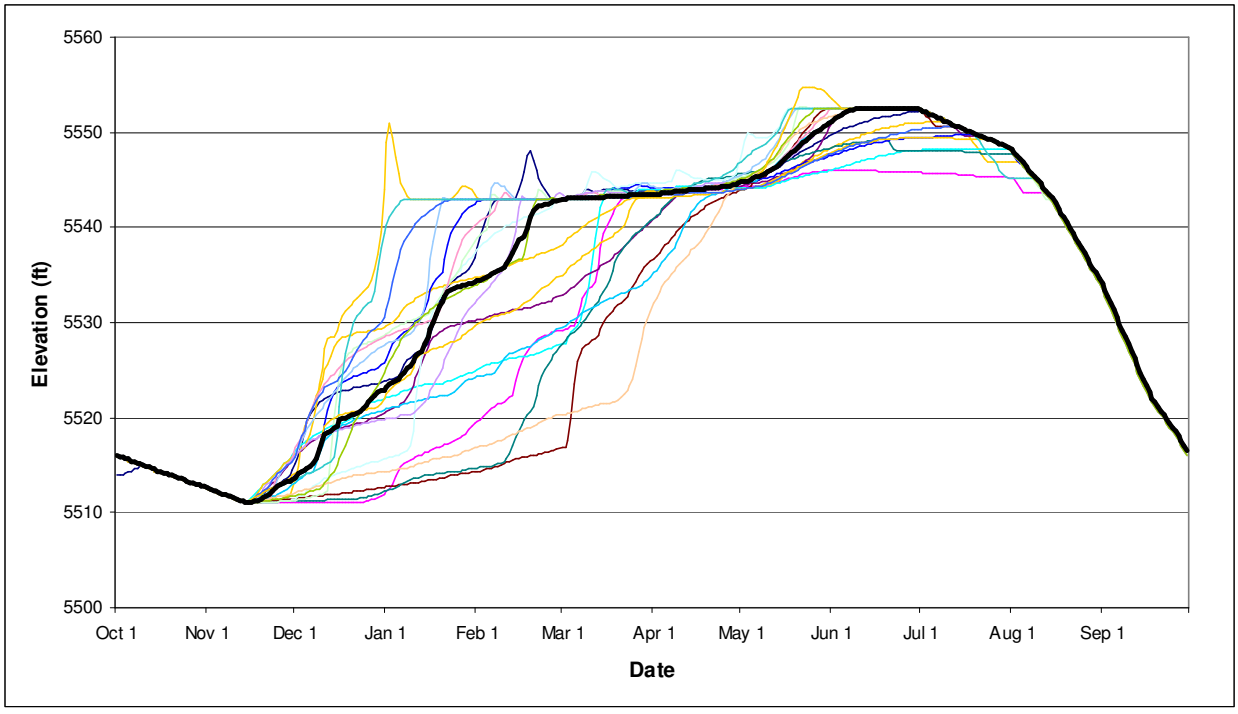


Figure 3-3. Philbrook reservoir water surface elevations during the period of record (1986 through 2005). The line in bold represents the average water surface elevations for a particular date. (Source: PG&E, 2007a)

Although the Commission's 1997 order placed a maximum temperature restriction of 18°C on water released from Philbrook reservoir, the Commission's 1998 order allowed for modification of the temperature criteria upon mutual agreement of NMFS, Cal Fish & Game, and FWS. Pursuant to the annual Project Operations and Maintenance Plan developed in consultation with the agencies, as previously discussed, water releases from Philbrook reservoir are typically made as soon as the releases from Round Valley reservoir begin to diminish in mid-July, with releases from Philbrook reservoir occurring through mid-September. Drafting is typically planned so that approximately 500 to 750 acre-feet remain in Philbrook reservoir in mid-September to insure that water is available to make minimum instream flow releases until the winter rains begin.

DeSabla Forebay – DeSabla forebay is located between the Butte Creek and West Branch Feather River drainage basins at an elevation of 2,700 feet msl on a fairly flat plateau above Butte Creek (figures 1-2 and 1-3). The natural drainage area of the forebay is 0.25 square miles and has a surface area of 15 acres at a maximum water surface elevation of 2,755 feet msl. The original storage capacity of DeSabla forebay was 188 acre-feet; however, sedimentation has reduced the storage capacity to 166 acre-feet, with a total usable capacity of 124 acre-feet. The mean depth of the forebay is currently 7.8 feet with a maximum depth at the dam of 21.7 feet.

DeSabla forebay is used as a regulating facility for the DeSabla powerhouse. Except during the routine annual maintenance period, the forebay fluctuates minimally, typically less than 0.2 foot, throughout the year and is managed to avoid spill, which rarely occurs.

*Project Bypassed Reaches, Dams and Canals*

Stream flow and canal flows in the project area are measured throughout the project area at gages maintained by PG&E in cooperation with USGS as shown in table 3-1. The streamflow gages are primarily designed to measure compliance with minimum instream flows in the bypassed stream reaches and diversion flows in the project canals. Consequently, when stream flows are spilling over the diversion dams (typically late winter and spring), the estimates of flow within the bypassed reaches of Butte Creek and the West Branch Feather River are low because these stream flows often exceed the rating curve of the streamflow gages. The only streamflow gages in the area that are rated to measure all of the stream flow is USGS gage no. 11390000 on Butte Creek near Chico, California, and USGS gage no. 11405300 on the West Branch Feather River near Paradise, California, downstream of the non-project Miocene diversion dam (table 3-1).[29]

[29] USGS gage no. 11390000 data also includes non-project stream flow from Little Butte Creek, which joins Butte Creek about 5 miles downstream of Centerville.

Table 3-1. Reservoir level gages and stream flow gaging stations in the project vicinity. (Source: PG&E, 2007a)

| | Watershed | PG&E ID | USGS No. | Station Name | USGS Period (WY) | PG&E Period (WY) | Status |
|---|---|---|---|---|---|---|---|
| 1 | Butte | BW97 | 11389720 | Butte Creek below Butte Creek diversion dam near Stirling City CA | 86 - 04 | 86 - 05 | -- |
| 2 | Butte | BW13 | --- | Butte Creek diversion dam spill (estimated) | -- | 87 - 05 | -- |
| 3 | Butte | BW14 | --- | Butte canal at Butte diversion dam | -- | 70 - 05 | -- |
| 4 | Butte | BW15 | --- | Butte canal above Toadtown canal | -- | 70 - 05 | -- |
| 5 | Butte | BW82 | 11389750 | DeSabla powerhouse near Paradise CA | 80 - 04 | 75 - 05 | -- |
| 7 | Butte | BW98 | 11389780 | Butte Creek below Centerville diversion dam | 86 - 04 | 86 - 05 | -- |
| 8 | Butte | BW19 | --- | Centerville diversion dam spill (estimated) | 86 - 04 | 87 - 05 | -- |
| 9 | Butte | BW20 | --- | Centerville canal near diversion dam | -- | 70 - 05 | -- |
| 10 | Butte | BW22 | --- | Centerville canal near forebay | -- | 70 - 05 | -- |
| 11 | Butte | BW80 | 11389775 | Centerville powerhouse near Paradise CA | 80 - 04 | 75 - 05 | -- |
| 12 | Butte | --- | 11390000 | Butte Creek near Chico CA | 30 - 04 | -- | -- |
| 13 | West Branch Feather River | BW1 | 11405075 | Snag Lake (Round Valley reservoir) near Jonesville CA | -- | 80 - 05 | -- |

| | Watershed | PG&E ID | USGS No. | Station Name | USGS Period (WY) | PG&E Period (WY) | Status |
|---|---|---|---|---|---|---|---|
| 14 | West Branch Feather River | BW45 | 11405085 | West Branch Feather River below Snag Lake near Jonesville CA | 93 - 03 | 86 - 05 | -- |
| 15 | West Branch Feather River | BW2 | 11405100 | Philbrook reservoir near Butte Meadows CA | -- | 80 - 05 | -- |
| 16 | West Branch Feather River | BW3 | 11405120 | Philbrook Creek below Philbrook reservoir near Butte Meadows CA | 89 - 04 | 86 - 05 | -- |
| 17 | West Branch Feather River | BW95 | 11405200 | West Branch Feather River below Hendricks diversion dam | 86 - 04 | 86 - 05 | Site moved |
| 18 | West Branch Feather River | BW7 | --- | Hendricks diversion dam spill (estimated) | -- | 86 - 05 | -- |
| 19 | West Branch Feather River | BW8 | --- | Hendricks canal at Head dam | -- | 70 - 05 | -- |
| 20 | West Branch Feather River | BW96 | 11405220 | Long Ravine below diversion dam near Stirling City CA | 96 - 03 | 86 - 05 | -- |
| 21 | West Branch Feather River | BW12 | 11389800 | Toadtown canal above Butte canal near Stirling City CA | 84 - 04 | 70 - 05 | -- |
| 22 | West Branch Feather River | --- | 11405300 | West Branch Feather River near Paradise CA | 57 - 86 | -- | Discontinued |
| 23 | West Branch Feather River | BW100 | 11389775 | Toadtown powerhouse | -- | 86 - 05 | -- |
| 24 | Combined | BW17 | --- | DeSabla forebay | -- | 94 - 05 | -- |

| | Watershed | PG&E ID | USGS No. | Station Name | USGS Period (WY) | PG&E Period (WY) | Status |
|---|---|---|---|---|---|---|---|
| 25 | Combined | BW18 | --- | Upper Centerville canal - release from DeSabla forebay | -- | 70 - 05 | -- |
| 26 | West Branch Feather River | BW24 | --- | Upper Miocene canal (Non-FERC license facility) | -- | 70 - 05 | -- |
| 27 | West Branch Feather River | BW23 | --- | West Branch Feather River below Miocene diversion (Non-FERC license facility) | -- | 76 - 05 | -- |

PG&E estimated the flows for Butte Creek upstream of the Butte Creek diversion dam and upstream of the Lower Centerville diversion dam, and for the West Branch Feather River upstream of the Hendricks diversion dam. In general, the flows were obtained by adding the diversion flows recorded for the associated project canal with the flow records from the streamflow gage downstream of the diversion (most often a USGS gage). Only a fraction of the total data available had information from both the canal and streamflow gages at each of the diversions. Using the combined gage data from the canal and streamflow gages, an estimate of the monthly minimum, maximum, and mean stream flows by month for the period of record was calculated upstream at each of these diversion structures (see discussion later in this section and particularly tables 3-4, 3-6, and 3-7). Instances where gage limitations resulted in low-biased flows are shown in bold. Due to the limitation of the rating curves associated with the streamflow gages, the mean and maximum data from February through May are biased low. The actual means and maximum stream flows are larger because discharges for spill events could not be measured at these streamflow gages. Usually the summer through fall months (e.g., June through November) were the only periods where sufficient data existed to construct meaningful flow duration curve estimates upstream of these diversion dams (i.e., a majority of the total data available had flow measurements from both the canal and streamflow gages at a given diversion).[30]

Utilizing a combination of recorded and synthesized data, PG&E developed a summary of hydrologic information, including mean annual flows, and maximum and minimum recorded flows, for the period of record (1986 to 2005) in the project area, as table 3-2 shows.

[30] Appendix E of the DeSabla-Centerville Hydroelectric Project Pre-Application Document filed on October 4, 2004, contains the monthly flow duration curves for Butte Creek and the West Branch Feather River where sufficient data was available to construct meaningful flow duration curves. Flow duration curves are presented for Butte Creek upstream of the Butte diversion dam (July through November), upstream of the Lower Centerville diversion dam (June through September), and near Chico, California (January through December), as well as for the West Branch Feather River upstream of Hendricks diversion dam (January, and June through December).

Table 3-2. Hydrologic data for the period of record (water years 1986 through 2005). (Source: PG&E, 2007a)

| | PG&E ID | Station Name | Units | POR Median | POR Mean | Annual Mean-Hi | Annual Mean-Low | Monthly Mean-Hi | Monthly Mean-Low | Daily Mean-Hi | Daily Mean-Low |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BW97 & BW13 | Butte Creek below Butte Creek diversion dam[1] | cfs | 25 | 111 | 280 (1995) | 27 (1990) | 286 (Feb) | 19 (Aug) | 10,989 (01/01/97) | 8 (Periodic) |
| 3 | BW14 | Butte canal at Butte diversion dam[2] | cfs | 50 | 49 | 66 (1988) | 26 (1997) | 62 (Jun) | 38 (Oct) | 108 (01/15/02) | 0 (Periodic) |
| 4 | BW15 | Butte canal above Toadtown canal[2] | cfs | 51 | 51 | 66 (1988) | 27 (1997) | 68 (Apr) | 33 (Oct) | 130 (12/16/97 | 0 (Periodic) |
| 5 | BW82 | DeSabla powerhouse[2] | cfs | 105 | 107 | 129 (1993) | 58 (1997) | 148 (Apr) | 60 (Oct) | 193 (01/05/86) | 0 (Periodic) |
| 7 | BW98 & BW19 | Butte Creek below Centerville diversion dam[1] | cfs | 70 | 208 | 497 (1995) | 67 (1990) | 501 (Feb) | 43 (Aug) | 12,961 (12/31/96) | 10 (Periodic) |
| 9 | BW20 | Centerville canal near diversion dam[2] | cfs | 111 | 105 | 131 (1993) | 67 (1997) | 151 (Apr) | 50 (Oct) | 183 (03/22/94) | 0 (Periodic) |
| 10 | BW22 | Centerville canal near forebay[2] | cfs | 114 | 107 | 131 (1988) | 59 (1997) | 156 (Apr) | 50 (Oct) | 1,100 (12/17/88) | 0 (Periodic) |
| 11 | BW80 | Centerville powerhouse[2] | cfs | 109 | 102 | 129 (1993) | 57 (1997) | 150 (Apr) | 46 (Oct) | 190 (02/29/92) | 0 (Periodic) |

| | PG&E ID | Station Name | Units | POR Median | POR Mean | Annual Mean-Hi | Annual Mean-Low | Monthly Mean-Hi | Monthly Mean-Low | Daily Mean-Hi | Daily Mean-Low |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | --- | Butte Creek[3] | cfs | 203 | 405 | 834 (1995) | 207 (1994) | 872 (Feb) | 112 (Sep) | 26,600 (01/01/97) | 45 (08/25/92) |
| 13 | BW1 | Snag Lake (Round Valley reservoir)[4] | ft, elev. | 5,632.8 | 5,635.9 | 5,639.5 (1998) | 5,630.3 (1988) | 5,649.1 (May) | 5,626.2 (Sep) | 5,653.6 (01/02/97) | 5,626.2 (Periodic) |
| 14 | BW45 | West Branch Feather River below Snag Lake[1] | cfs | 1.4 | 6.2 | 14.3 (1995) | 1.3 (1988) | 11.4 (Mar) | 1.4 (Oct) | 571 (01/01/97) | 0 (Periodic) |
| 15 | BW2 | Philbrook reservoir[4] | cfs | 5,539.2 | 5,533.8 | 5,536.8 (2003) | 5,529.4 (2001) | 5,550.9 (Jun) | 5,512.0 (Nov) | 5,554.8 (05/24/05) | 5,511.0 (Periodic) |
| 16 | BW3 | Philbrook Creek below Philbrook reservoir[1] | ft, elev. | 4.3 | 16.7 | 29.8 (1995) | 7.5 (1992) | 28.3 (Aug) | 5.3 (Nov) | 1,413 (01/01/97) | 1 (Periodic) |
| 17 | BW95 & BW7 | West Branch Feather River below Hendricks diversion dam[1] | cfs | 21 | 109 | 279 (1995) | 25 (1994) | 239 (Mar) | 18 (Oct) | 12,580 (01/01/97) | 7 (02/26/89) |
| 19 | BW8 | Hendricks canal at Head dam[2] | cfs | 64 | 65 | 86 (1999) | 31 (1997) | 94 (Apr) | 35 (Oct) | 1,013 (07/05/05) | 0 (Periodic) |
| 20 | BW96 | Long Ravine below diversion dam[2] | cfs | -- | -- | -- | -- | -- | -- | -- | -- |

| | PG&E ID | Station Name | Units | POR Median | POR Mean | Annual Mean-Hi | Annual Mean-Low | Monthly Mean-Hi | Monthly Mean-Low | Daily Mean-Hi | Daily Mean-Low |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | BW12 | Toadtown canal above Butte canal[2] | cfs | 62 | 64 | 84 (1993) | 36 (1997) | 93 (Mar) | 31 (Oct) | 127 (02/12/95) | 0 (Periodic) |
| 23 | BW100 | Toadtown powerhouse[2] | cfs | -- | -- | -- | -- | -- | -- | -- | -- |
| 24 | BW17 | DeSabla reservoir[4] | ft, elev. | 2,753.0 | 2,753.0 | 2,753.0 (Periodic) | 2,753.0 (Periodic) | 2,753.0 (Periodic) | 2,753.0 (Periodic) | 2,753.0 (Periodic) | 2,753.0 (Periodic) |
| 25 | BW18 | Upper Centerville canal from DeSabla forebay[2] | cfs | 3.0 | 2.9 | 4.2 (1988) | 1.9 (1997) | 4.3 (Apr) | 2.5 (Jul) | 15.0 (Periodic) | 0.0 (Periodic) |

Notes: (1) Combination of PG&E recorded data and synthesized data; (2) PG&E recorded data; (3) USGS recorded data; (4) HEC-ResSim DeSabla-Centerville Operations Model data.

*Upper West Branch Feather River-Downstream of Round Valley Reservoir Dam*

Flows from Round Valley reservoir are released to the upper West Branch Feather River from either an overflow spillway or through a manually operated low level outlet valve. Currently, there is a minimum instream flow requirement to the upper West Branch Feather River of 0.5 cfs from Round Valley reservoir during normal water year types and 0.1 cfs during dry water year types (table 3-3). Coon Hollow Creek enters the West Branch Feather River approximately 1.3 miles downstream of Round Valley reservoir dam (see figure 1-3).

Table 3-3. Current minimum instream flow requirements (in cfs) downstream of project diversions. (Feeder creeks are indicated in bold). (Source: Staff)

| | **Volume of Discharge (in cfs) During Normal and Dry Water Year Types** | | |
|---|---|---|---|
| **Point of Diversion** | **Normal** | **Dry** | **Time Period** |
| Round Valley reservoir | 0.5 | 0.1 | |
| Philbrook reservoir | 2 | 2 | |
| Hendricks diversion dam | 15 | 7 | |
| Butte Creek diversion dam | 16 | 7 | |
| Lower Centerville diversion dam | 40 | 10 | Sept. 15-Oct. 31 and Dec. 15 –May 31 |
| | 30 | 10 | Nov. 11-Dec. 14 |
| | 40 | 40 | June 1-Sept. 14 |
| **Inskip Creek** | 0.25 | 0.1 | |
| **Kelsey Creek** | 0.25 | 0.1 | |
| **Stevens Creek** | 0.25 | 0.1 | Discontinued |
| **Emma Ravine** | 0.25 | 0.1 | Discontinued |
| **Coal Claim Ravine** | 0.25 | 0.1 | Discontinued |
| **Oro Fino Ravine** | 0.25 | 0.1 | Discontinued |
| **Little West Fork** | 0.25 | 0.1 | |
| **Cunningham Ravine** | 0.25 | 0.1 | |
| **Clear Creek** | 0.5 | 0.25 | |
| **Long Ravine** | 0.5 | 0.25 | |

Flows for the West Branch Feather River downstream of Round Valley reservoir dam as measured at PG&E's gage no. BW45 during the period of record are shown in table 3-2 and flow duration curves for this reach are shown in figure 3-4.

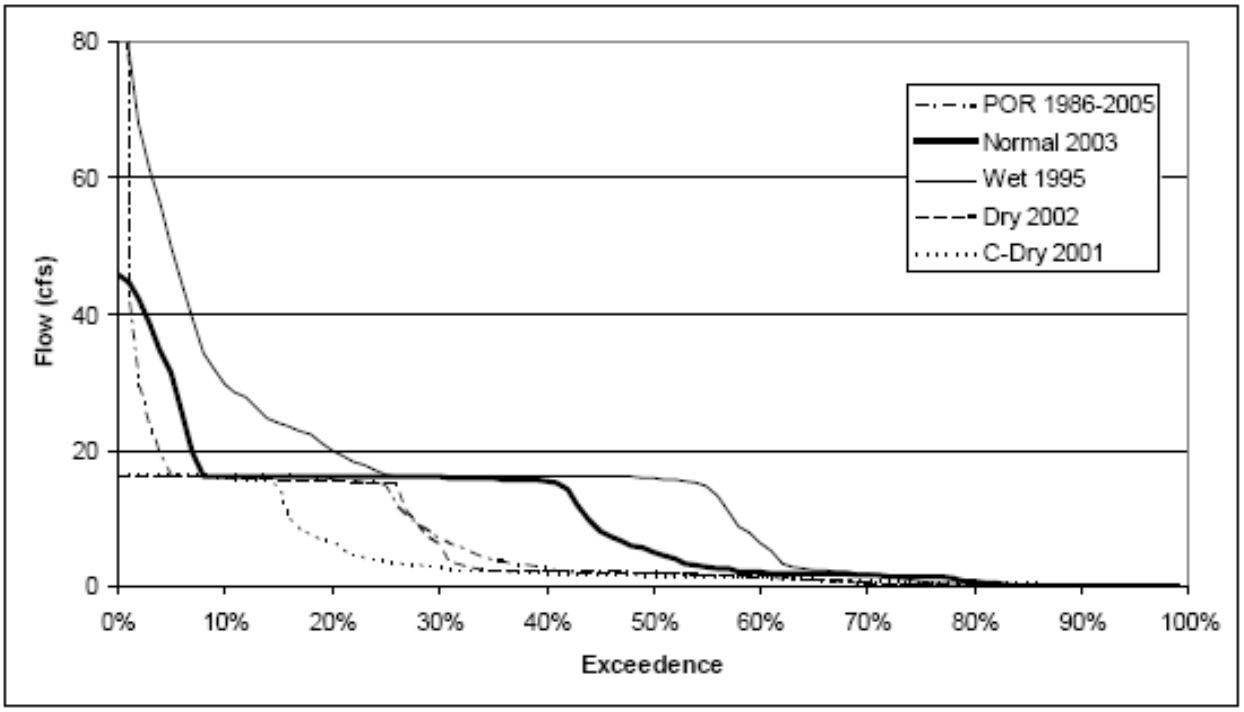


Figure 3-4. Flow duration curves for the West Branch Feather River downstream of Round Valley reservoir dam including the average for the period of record (1986 to 2005), normal, wet, dry, and critically dry water year types. (Source: PG&E, 2007a)

*Upper West Branch Feather River-Downstream of Philbrook Reservoir Dam*

Under the current license there is a year-round minimum instream flow of 2 cfs from Philbrook reservoir dam (table 3-3). Flows for the West Branch Feather River downstream of Philbrook reservoir dam as measured at PG&E's gage no. BW3 during the period of record are shown in table 3-2 and flow duration curves for this reach are shown in figure 3-5.

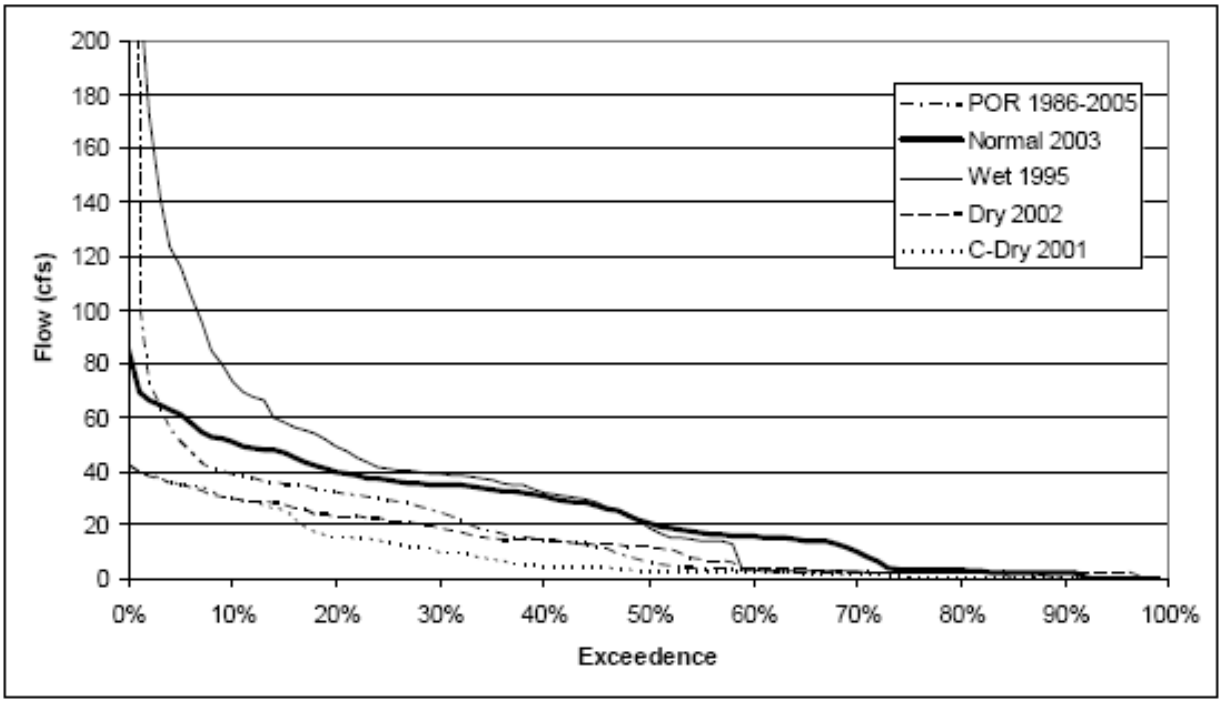


Figure 3-5. Flow duration curves for Philbrook Creek downstream of Philbrook reservoir dam including the average for the period of record (1986 to 2005), normal, wet, dry, and critically dry water year types. (Source: PG&E, 2007a)

Lower West Branch Feather River-Downstream of Hendricks Diversion Dam – The Hendricks diversion dam is located on the West Branch Feather River approximately 12 miles downstream of Round Valley reservoir. Hendricks diversion dam is 15 feet high and is utilized to divert water into the 8.66-mile-long Hendricks canal (figure 1-2). The canal is composed mainly of earthen ditch with several flume and tunnel sections and carries a maximum of 125 cfs to the Toadtown powerhouse. Table 3-2 contains flows for the period of record for Hendricks canal, as measured at PG&E's gage no. BW8.

The first section of Hendricks canal includes a tunnel under Stirling City that carries water to Long Ravine Creek where it is released. A short section of Long Ravine Creek is used for water conveyance, connecting two portions of Hendricks canal. Long Ravine diversion dam is 2.4 miles downstream from the West Branch Feather River at the Hendricks diversion dam. The Long Ravine diversion dam is a small dam, approximately 40 feet long with a concrete foundation and timber flashboards approximately 6 feet high. Hendricks canal then follows the contour of the land and is well shaded. Hendricks canal also includes an additional tunnel section downstream of Long Ravine diversion dam.

PG&E estimated the flows for the West Branch Feather River upstream of the Hendricks diversion dam by adding the diversion flows recorded for Hendricks canal

(PG&E gage no. BW8) with the flow records from the USGS gage downstream of Hendricks diversion dam (USGS gage no. 11405200). Table 3-4 shows the monthly minimum, mean, and maximum stream flows obtained for the period of record upstream of Hendricks diversion dam. Instances where gage limitations resulted in low-biased flows are shown in bold. Only 63 percent of the total data available had information from both gages concurrently.

Table 3-4. Mean monthly flows for the West Branch Feather River upstream of Hendricks diversion dam when both gages (PG&E gage no. BW8 and USGS gage no. 11405200) were available to estimate flow. (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 22 | 118 | 80 |
| February | 56 | **131** | **100** |
| March | 80 | **148** | **127** |
| April | 127 | **157** | **138** |
| May | 120 | **172** | **138** |
| June | 65 | 134 | 100 |
| July | 38 | 136 | 82 |
| August | 31 | 130 | 74 |
| September | 27 | 128 | 58 |
| October | 30 | 128 | 52 |
| November | 29 | 74 | 54 |
| December | 31 | 120 | 73 |

[a] Data are from October 1, 1986 through September 30, 2002. Flows in bold show flows based on limited data sets that produce an underestimate of the mean and maximum monthly flow.

During low flow periods, Hendricks diversion dam diverts the entire West Branch Feather River flow. However, a year-round minimum instream flow of 15 cfs during normal water year types and 7 cfs during dry water year types is released to West Branch Feather River downstream of the Hendricks diversion dam (table 3-3). Flows for the West Branch Feather River downstream of Hendricks diversion dam as measured at PG&E's gage nos. BW95 and BW7 during the period of record are shown in table 3-2 and flow duration curves for this reach are shown in figure 3-6.

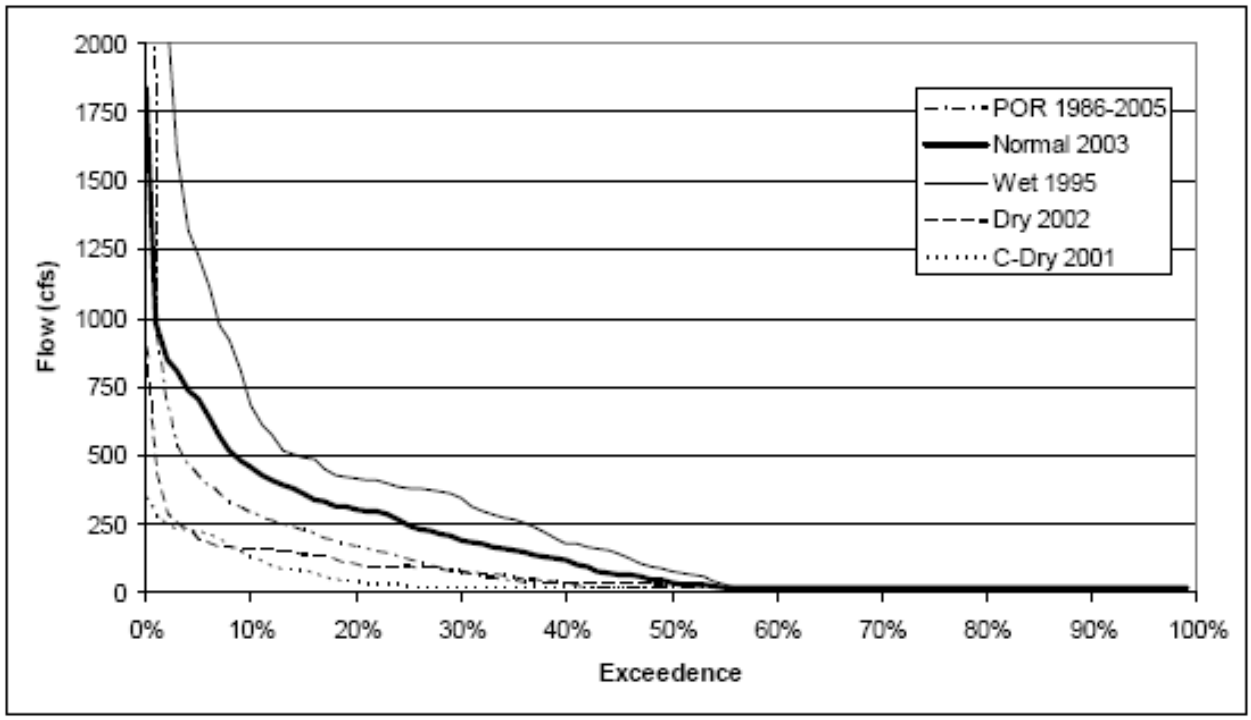


Figure 3-6. Flow duration curves for the West Branch Feather River downstream of Hendricks diversion dam including the average for the period of record (1986 to 2005), normal, wet, dry, and critically dry water year types. (Source: PG&E, 2007a)

Long Ravine – There are no flow estimates for Long Ravine upstream of the discharge from Hendricks canal, which diverts water from the West Branch Feather River, as previously described. Water from Hendricks canal enters Long Ravine Creek approximately 1 mile upstream of the Long Ravine diversion dam, where it is diverted back into the continuation of Hendricks canal (figures 1-2 and 1-3). The gaging station that historically measured flows in Hendricks canal downstream of the diversion dam (PG&E gage no. BW52) was discontinued in 1985. The USGS gage located in Long Ravine, downstream of the diversion dam (USGS gage no. 11405220), began operation in 1996. This USGS gage is intended to measure compliance with minimum instream flow requirements. Consequently, there is currently no way to determine the quantity of flow from Long Ravine that is intercepted by Long Ravine diversion dam. Table 3-5 shows the mean monthly minimum, mean, and maximum stream flows obtained for the period of record at the USGS gage downstream of the diversion for the period of record (1996 to 2002).

Table 3-5. Mean monthly flows for Long Ravine downstream of Long Ravine diversion dam as measured at USGS gage no. 11405220. (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 1.00 | 1.00 | 1.00 |
| February | 1.00 | 1.00 | 1.00 |
| March | 1.00 | 1.00 | 1.00 |
| April | 0.82 | 1.00 | 0.91 |
| May | 1.00 | 1.00 | 1.00 |
| June | 0.61 | 1.00 | 0.91 |
| July | 0.56 | 1.00 | 0.93 |
| August | 0.56 | 1.00 | 0.93 |
| September | 0.53 | 1.00 | 0.91 |
| October | 0.60 | 1.00 | 0.93 |
| November | 0.97 | 1.00 | 0.99 |
| December | 0.99 | 1.00 | 1.00 |

[a] Data are from October 1, 1996 through September 30, 2002.

Current year-round minimum instream flows released to Long Ravine downstream of Long Ravine diversion dam are 0.5 cfs during normal water year types and 0.25 cfs during dry water year types (table 3-3).

Butte Creek Diversion Dam – Water is first diverted from the Butte Creek drainage for project operations at the 50-foot-high Butte Creek diversion dam (figure 1-3). Water is diverted at this location into Butte canal, which is 11.4 miles long and has a capacity of approximately 91 cfs. Flows for Butte canal as measured at PG&E's gage nos. BW14 and BW15 are shown in table 3-2. The canal is comprised of earthen berm, gunite, tunnel, a siphon, and flume sections. The canal follows the contour of the hillside and is well shaded. Approximately 0.7 mile upstream of DeSabla forebay, Butte canal and Toadtown canal (carrying water diverted from the West Branch Feather River) join together and flow into DeSabla forebay (figure 1-3). The confluence of Butte canal with Toadtown canal is approximately 10.7 miles downstream from Butte Creek diversion dam and the canal capacity downstream of this confluence increases to approximately 191 cfs.

PG&E estimated the flows for Butte Creek upstream of the Butte Creek diversion dam by adding the diversion flows recorded for Butte canal (PG&E gage no. BW14) with the flow records from the USGS gage downstream of the diversion (USGS gage no.

11389720), as previously described. Table 3-6 shows the monthly minimum, mean, and maximum stream flows obtained for the period of record upstream of the Butte Creek diversion dam. Instances where gage limitations resulted in low-biased flows are shown in bold. Only 29 percent of the total data available had information available from both the instream flow and the canal gage concurrently.

Table 3-6. Mean monthly flows for Butte Creek upstream of Butte Creek diversion dam when both gages (PG&E gage no. BW14 and USGS gage no. 11389720) were available to estimate flow. (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 20 | **119** | **78** |
| February | 59 | **112** | **81** |
| March | 104 | **123** | **112** |
| April | 111 | **113** | **112** |
| May | 83 | **124** | **106** |
| June | 66 | **127** | **90** |
| July | 56 | 114 | 76 |
| August | 49 | 100 | 67 |
| September | 46 | 89 | 61 |
| October | 48 | 88 | 64 |
| November | 51 | 86 | 66 |
| December | 34 | 99 | 75 |

[a] Data are from October 1, 1986 through September 30, 2002. Flows in bold show indicate flows based on limited data sets that produce an underestimate of the mean and maximum monthly flow.

Current year-round minimum instream flows released to Butte Creek downstream of the Butte Creek diversion dam are 16 cfs during normal water year types and 7 cfs during dry water year types (table 3-3). Flows for Butte Creek downstream of Butte Creek diversion dam as measured at PG&E's gage nos. BW97 and BW13 during the period of record are shown in table 3-2 and flow duration curves for this reach are shown in figure 3-7.

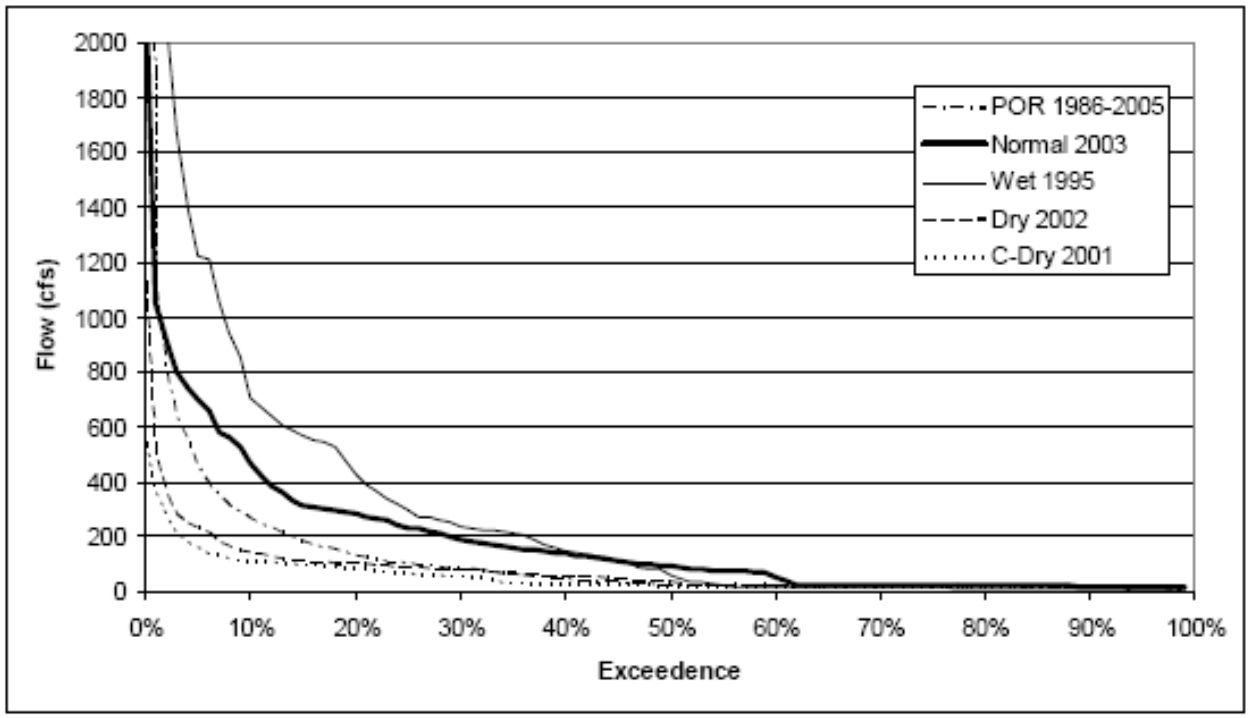


Figure 3-7. Flow duration curves for Butte Creek downstream of Butte Creek diversion dam including the average for period of record (1986 to 2005), normal, wet, dry, and critically dry water year types. (Source: PG&E, 2007a)

About 7 miles downstream of Butte Creek diversion dam on Butte Creek is the non-project Forks of Butte Project diversion dam (FERC Project No. 6896), which diverts water for use at Forks of Butte powerhouse (figure 1-3).[31] The Forks of Butte powerhouse is approximately 9.7 stream miles downstream from Butte Creek diversion dam, and 0.25 mile upstream of DeSabla powerhouse. The Forks of Butte Project can divert up to 275 cfs, with a required year-round minimum instream flow of 47 cfs, or inflow, whichever is less, downstream of the diversion dam. As a result of the 47 cfs minimum instream flow requirement at the Forks of Butte Project diversion dam, the Forks of Butte powerhouse does not operate through most of the summer due to inadequate flows being available to meet the minimum instream flow requirement and to operate the Forks of Butte powerhouse.

Lower Centerville Diversion Dam – Lower Centerville diversion dam is a 12-foot-high dam located 0.2 mile downstream of the DeSabla powerhouse (figure 1-3). Lower Centerville diversion dam diverts up to 183 cfs from Butte Creek into the Lower Centerville canal. Lower Centerville canal is approximately 8 miles long and carries water to Centerville powerhouse (figure 1-3). Lower Centerville canal is composed of

[31] These facilities are owned by Energy Growth Partnership, Inc.

earthen canal with several flume sections, and is exposed to more solar radiation than either the Hendricks or Butte canals. Flows for Lower Centerville canal as measured at PG&E's gage nos. BW20 and BW22 for the period of record are shown in table 3-2.

PG&E estimated the flows for Butte Creek upstream of Lower Centerville diversion dam by adding the diversion flows recorded for Lower Centerville canal (PG&E gage no. BW20) with the flow records from the USGS gage downstream of Lower Centerville diversion dam (USGS gage no. 11389780). Table 3-7 shows the monthly minimum, mean, and maximum stream flows obtained for the period of record upstream of Lower Centerville diversion dam in Butte Creek. Instances where gage limitations resulted in low-biased flows are shown in bold. Only 45 percent of the total data available had information from both the instream flow and canal gages concurrently.

Table 3-7. Mean monthly flows for Butte Creek upstream of Lower Centerville diversion dam when both gages (PG&E gage no. BW20 and USGS gage no. 11389780) were available to estimate flow. (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 86 | **192** | **154** |
| February | 98 | **249** | **161** |
| March | 212 | **253** | **233** |
| April | 203 | **240** | **219** |
| May | 156 | **238** | **195** |
| June | 127 | **223** | **169** |
| July | 122 | 203 | 147 |
| August | **71** | 223 | **130** |
| September | 54 | 160 | 97 |
| October | 58 | **182** | **109** |
| November | 82 | **175** | **115** |
| December | 79 | **212** | **143** |

[a] Data are from October 1, 1986 through September 30, 2002. Flows in bold show flows based on limited data sets that produce an underestimate of the mean and maximum monthly flow.

During low flow periods, Lower Centerville diversion dam diverts the entire flow of Butte Creek into the canal. Current year-round minimum instream flows released to Butte Creek downstream of the Lower Centerville diversion dam range between 30 to 40 cfs in normal water year types, and 10 to 40 cfs in dry water year types, as shown in table 3-3. Flows for Butte Creek downstream of Lower Centerville diversion dam as measured

at PG&E's gage nos. BW98 and BW19 during the period of record are shown in table 3-2 and flow duration curves for this reach are shown in figure 3-8.

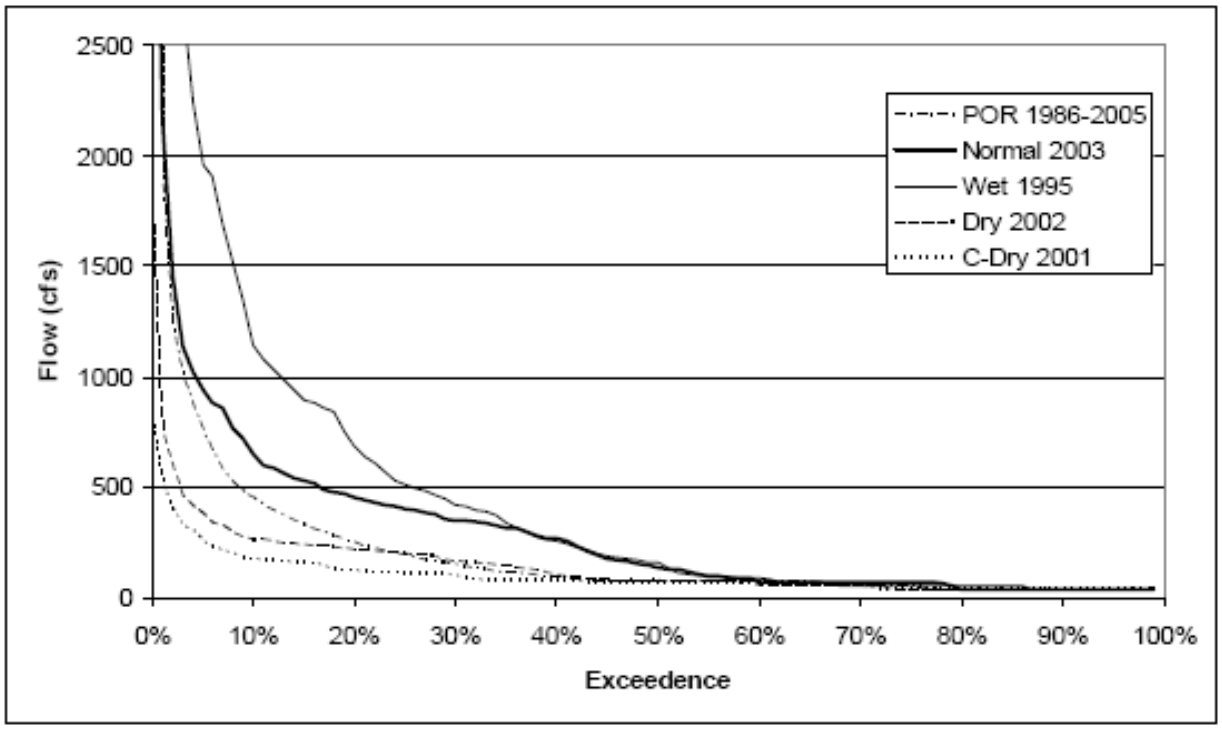


Figure 3-8. Flow duration curves for Butte Creek downstream of Lower Centerville diversion dam including the average for the period of record (WY 1986 to 2005), normal, wet, dry, and critically dry water year types. (Source: PG&E, 2007a)

*Flows for Toadtown, DeSabla, and Centerville Powerhouse Intakes*

Toadtown Powerhouse – Toadtown powerhouse is located on Hendricks canal approximately 8.6 miles downstream of Hendricks diversion dam (figure 1-3). There is no storage reservoir associated with this powerhouse. The Toadtown powerhouse contains one Francis turbine with a maximum hydraulic capacity of 134 cfs and a minimum hydraulic capacity of 25 cfs. If the flow in the Hendricks canal is less than the 25 cfs minimum operating flow, the water is directed through a bypass into Toadtown canal downstream of the powerhouse. PG&E estimated the flows for Toadtown powerhouse using powerhouse outflow records from PG&E's gage no. BW100. Table 3-8 shows the monthly minimum, mean, and maximum flows by month for the period of record for Toadtown powerhouse.

Table 3-8. Mean monthly flows for Toadtown powerhouse outflow as measured at PG&E's gage no. BW100. (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 4 | 118 | 73 |
| February | 4 | 135 | 84 |
| March | 1 | 154 | 112 |
| April | 0 | 155 | 109 |
| May | 0 | 182 | 126 |
| June | 51 | 179 | 139 |
| July | 78 | 171 | 117 |
| August | 27 | 157 | 90 |
| September | 21 | 127 | 68 |
| October | 0 | 97 | 41 |
| November | 2 | 85 | 51 |
| December | 23 | 111 | 68 |

[a] Data are from October 1, 1986 through September 30, 2002.

Toadtown canal is in essence the continuation of Hendricks canal from the tailrace of the Toadtown powerhouse to its confluence with Butte Creek canal (figure 1-3). Toadtown canal joins Butte canal approximately 0.7 mile upstream of DeSabla forebay. Toadtown canal is principally an earthen canal with a capacity of 125 cfs and a total length of approximately 2.4 miles. Flows for Toadtown canal as measured at PG&E's gage no. BW12 during the period of record are shown in table 3-2.

DeSabla Powerhouse – The intake for DeSabla powerhouse is located in DeSabla forebay, a 166 acre-foot reservoir that is supplied with water from the combined flow of Butte and Toadtown canals, as described previously. DeSabla powerhouse is located approximately 1.3 miles downstream from DeSabla forebay on Butte Creek (figure 1-3). DeSabla powerhouse contains one Pelton turbine, with a maximum hydraulic capacity of 191 cfs. Discharge from the powerhouse enters Butte Creek 0.2 mile upstream of the Lower Centerville diversion dam. PG&E estimated the flows for the DeSabla powerhouse intake using the flow records from the USGS gage that measures outflow from the powerhouse (USGS gage no. 11389750; PG&E gage no. BW82). Table 3-9 shows the monthly minimum, mean, and maximum flows by month for the period of record for DeSabla powerhouse outflow.

Table 3-9. Mean monthly flows for the DeSabla powerhouse outflow (USGS gage no. 11389750; PG&E gage no. BW82). (Source: PG&E, 2004)

| Month | Minimum (in cfs) [a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 7 | 184 | 122 |
| February | 7 | 183 | 131 |
| March | 1 | 191 | 155 |
| April | 0 | 190 | 160 |
| May | 0 | 184 | 148 |
| June | 51 | 182 | 142 |
| July | 78 | 180 | 119 |
| August | 27 | 177 | 96 |
| September | 21 | 127 | 68 |
| October | 25 | 123 | 70 |
| November | 47 | 178 | 96 |
| December | 45 | 183 | 118 |

[a] Data are from October 1, 1980 through September 30, 2002. No adjustments to these estimates were made for evaporation, leakage, or water rights releases (into the Upper Centerville canal) from DeSabla forebay.

The Upper Centerville canal originates at DeSabla forebay and historically was used as an alternate route to direct water to Centerville powerhouse when DeSabla powerhouse was out of service (figure 1-3). The canal ends at Helltown Ravine, where water can be released and then recaptured by a diversion dam located where Helltown Ravine crosses Lower Centerville canal. Upper Centerville canal has not been used to carry water for power generation for many years and currently carries only a few cfs for local water users. Flows for Lower Centerville canal as measured at PG&E's gage no. BW18 are shown in table 3-2.

Centerville Powerhouse – The intake for the Centerville powerhouse is located at the terminus of Lower Centerville canal (figure 1-3). The Centerville powerhouse contains one Francis and one Pelton turbine. The two units have a combined maximum hydraulic capacity of 183 cfs. The Centerville powerhouse discharges water directly into Butte Creek, approximately 5.3 miles downstream of Lower Centerville diversion dam.

PG&E estimated the flows for the Centerville powerhouse intake using the flow records from the USGS gage that measures the outflow from the powerhouse (USGS gage no. 11389775; PG&E gage no. BW80). Table 3-10 shows the monthly minimum, mean, and maximum flows for the period of record for Centerville powerhouse outflow.

Table 3-10. Mean monthly flows for Centerville powerhouse outflow (USGS gage no. 11389775; PG&E gage no. BW80). (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 0 | 191 | 118 |
| February | 0 | 190 | 134 |
| March | 0 | 190 | 150 |
| April | 43 | 186 | 160 |
| May | 101 | 190 | 159 |
| June | 71 | 186 | 140 |
| July | 64 | 182 | 114 |
| August | 17 | 177 | 92 |
| September | 0 | 142 | 67 |
| October | 3 | 102 | 50 |
| November | 22 | 174 | 73 |
| December | 39 | 190 | 112 |

[a] Data are from October 1, 1980 through September 30, 2002. No adjustments to these estimates were made for evaporation or leakage (from Lower Centerville canal).

*Lower Butte Creek-Near Chico, California*

The gage (USGS gage no. 11390000) near the downstream end of the project-affected reach in Butte Creek has the most complete set of hydrological records. Table 3-11 shows the monthly minimum, mean, and maximum stream flows by month for the period of record (1930 through 2002) at this gage.

Table 3-11. Mean monthly flows for Butte Creek near Chico, California, as measured at USGS gage no. 11390010. (Source: PG&E, 2004)

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| January | 91 | 2847 | 687 |
| February | 114 | 2925 | 815 |
| March | 123 | 2601 | 765 |
| April | 114 | 1848 | 673 |
| May | 134 | 1314 | 498 |
| June | 79 | 773 | 285 |

| Month | Minimum (in cfs)[a] | Maximum (in cfs) | Mean (in cfs) |
|---|---|---|---|
| July | 54 | 356 | 165 |
| August | 46 | 223 | 133 |
| September | 52 | 183 | 119 |
| October | 66 | 775 | 138 |
| November | 78 | 1269 | 225 |
| December | 89 | 2061 | 454 |

[a] Data are from October 1, 1930 through September 30, 2002.

*Feeder Creeks*

There are twelve feeder creeks that have small diversion structures which are currently used or have been used in the past to divert flow into project canals (see figure 1-2). Except for Long Ravine (previously discussed), there are no streamflow gages on these feeder creeks. The feeder creeks include:

- Creeks diverted into Butte canal: Inskip Creek, Kelsey Creek, and Clear Creek (use of the diversion at Stevens Creek has been discontinued);

- Creeks diverted into Hendricks/Toadtown canal: Long Ravine, Cunningham Ravine, Little West Fork and Little Butte Creek (Little Butte Creek diversion can only be used when the downstream Paradise and Magalia reservoirs are spilling); and

- Creeks diverted into Lower Centerville canal: Helltown Ravine (use of the Oro Fino Ravine, Coal Claim Ravine, and Emma Ravine diversions has been discontinued).

Minimum instream flows released downstream of these feeder creek diversions range from 0.25 to 0.5 cfs during normal water year types and 0.1 to 0.25 cfs during dry water year types, as table 3-3 shows.

*Water Use*

PG&E holds water rights to store, divert, and use water from Butte Creek, the West Branch Feather River, and their tributaries, for the production of power as well as for fishery, recreation, and irrigation activities. Record searches of the Water Board by PG&E indicate a total of 138 water rights applications were on file (appendix D). PG&E's rights to divert and use water for operation of the project are primarily non-consumptive in nature.

Small-scale suction dredging for gold occurs in Butte Creek pursuant to permits issued by Cal Fish & Game. Like fishing permits, these dredging permits are general in nature and do not restrict activity to a specific site. The total number of active permits varies yearly and is not readily available.

Although PG&E has no public utility obligation to deliver water for consumptive uses, project features are at times used for the delivery of water to others for such uses. PG&E provides minor amounts of project water for irrigation uses along the Upper Centerville, Hendricks, and Lower Centerville canals. There are no steam electric or industrial uses of project waters within the project area. Little Butte Creek flows into Paradise Lake, a municipal water supply (figure 1-3). In addition, Del Oro Water Company uses Hendricks canal water to meet municipal water supply demands in Stirling City by diverting up to 100 acre-feet per year from this canal. This quantity of water was retained by Del Oro from an original 365 acre-feet that once belonged to Diamond Match. Diamond Match used its water for its mill in Stirling City and also provided domestic water service in the area. The remaining 265 acre-feet was purchased by PG&E with the condition that Del Oro retains the ability to purchase this amount upon request, each year, pending availability. This water, when delivered, is delivered at an existing slide gate on the Toadtown canal at a point approximately 1,440 feet downstream of Toadtown powerhouse, which releases into Little Butte Creek.

Minor consumptive uses have historically occurred along the Upper Centerville canal and a flow of approximately 3 cfs is maintained in this canal for such uses (table 3 - 2). Additional water deliveries are made at the Toadtown header box to Eldon Duinsing and on the Lower Centerville canal near Helltown to Alan Harthorn.

In addition to the deliveries previously discussed, that are made from project facilities, PG&E makes deliveries of water to the California Water Service Company and PG&E customers downstream of the Hendricks diversion dam. These deliveries are made at the end of PG&E's small Miocene system which discharges into the California Water Service Company's Powers canal. The California Water Services Company uses these deliveries to serve irrigation customers and a portion of the needs of the City of Oroville. The current minimum instream flow release at Hendricks diversion dam plus accretion flows to the West Branch Feather River typically provide an adequate supply of water to meet California Water Service Company needs.

**Water Quality**

Water quality standards applicable to surface waters in the project area are defined in three primary documents and are summarized in table 3-12: the California Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan) for the Central Valley Region (CVRWQCB, 2006), the California Toxics Rule (40 CFR Part 131)

(California Toxics Rule; EPA, 2000), and drinking water standards set in California Code of Regulations Title 22 (CDHS, 2006).

The water resources of Butte Creek basin are divided into two sub-basins by the Central Valley Region Water Quality Control Board in its Basin Plan. The two sub-basins are defined as upper Butte Creek from its source to Chico, California, and lower Butte Creek from Chico, California, to the Sacramento River. Designated uses for upper Butte Creek include municipal and domestic supply, irrigation and stock watering, contact recreation, power production, warm and cold freshwater habitat, cold water migration, warm and cold water spawning, and wildlife habitat. Designated uses for lower Butte Creek include irrigation and stock watering, contact recreation and canoeing-rafting, warm and cold freshwater habitat, cold water migration, warm water spawning, and wildlife habitat.

Table 3-12. Summary of applicable water quality objectives to support beneficial uses in the study area. (Source: CVRWQCB, 2006; EPA, 2000; and CDHS, 2006)

| Parameter | Objective/Standard | Reference |
|---|---|---|
| Temperature | The natural receiving water temperature of interstate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board that such alteration in water temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 2.8°C above natural receiving-water temperature. | CVRWQCB, 2006 |
| Dissolved oxygen | Monthly median of the average daily dissolved oxygen concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. Minimum level of 7 mg/L. When natural conditions lower dissolved oxygen below this level, the concentrations shall be maintained at or above 95 percent of saturation. | CVRWQCB, 2006 |
| pH | The pH of surface waters will remain between 6.5 to 8.5, and cause changes of less than 0.5 in receiving water bodies. | CVRWQCB, 2006 |

| Parameter | Objective/Standard | Reference |
|---|---|---|
| Fecal coliform bacteria | In terms of fecal coliform: less than a geometric average of 200 per 100 mL water on five samples collected in any 30-day period and less than 400 per 100 mL on 10 percent of all samples taken in a 30-day period. | CVRWQCB, 2006 |
| Turbidity | In terms of changes in turbidity (NTU) in the receiving water body: where natural turbidity is 0 to 5 NTUs, increases shall not exceed 1 NTU; where 5 to 50 NTUs, increases shall not exceed 20 percent; where 50 to 100 NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 100 NTUs, increase shall not exceed 10 percent. | CVRWQCB, 2006 |
| Tastes and odor | Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes and odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses. | CVRWQCB, 2006 |
| Sodium | 30-60 mg/L | EPA, 2004 |
| Chemical constituents | Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Although certain trace element levels have been applied to particular water bodies, no portion of the project-affected area is cited within the Basin Plan (CVRWQB, 2006). Other limits for organic, inorganic and trace metals are provided for surface waters that are designated for domestic or municipal water supply. In addition, waters designated for municipal or domestic use must comply with portions of Title 22 of the California Code of Regulation. | CVRWQCB, 2006 |
| Mercury | 50 ng/L | EPA, 2000a |

| Parameter | Objective/Standard | Reference |
|---|---|---|
| | Primary MCL of 0.002 mg/L | CDHS, 2006 |
| Methyl Mercury | 70 ng/L | EPA, 2001 |

[a] The Basin Plan's toxicity water quality objective is to maintain waters free of toxic substance concentrations that produce detrimental physiological responses in human, plant, animal, and aquatic life. Therefore, we use criteria set in the California Toxics Rule (40 CFR Part 131) to assess the support of these beneficial uses. These criteria are for dissolved metals, rather than total metals, are based on sample hardness and dissolved concentrations of copper, nickel, and silver.

mg/L milligrams per liter

ng/L nanograms per liter

mL milliliter

NTU nephelometric turbidity units

MCL maximum contaminant level

CVRWQCB Central Valley Region Water Quality Control Board

CDHS California Department of Health Service

*General Water Quality*

Water quality in the project area generally reflects the geology, physiography, and climatology of the area. Variations in water quality occur seasonally and inter-annually depending upon hydrological conditions, including responses to high-flow events (i.e., precipitation, snow melt), runoff from roadways, diversions, and inter-basin transfers.

As part of this relicensing, PG&E monitored water quality at 15 locations throughout the project area (tables 3-13 and 3-14), including: Philbrook and Round Valley reservoirs, DeSabla forebay, five locations along the West Branch Feather River, and seven locations along Butte Creek. Water samples were collected during the 2006 spring runoff period (May), the 2006 and 2007 summer low-flow period (August), and in fall 2006 following overturn of summer thermal stratification (October, prior to first major rain event).[32] More specific details about sampling sites, frequency, and parameters measured are contained in the license application (PG&E, 2007a).

[32] Round Valley reservoir was dry by the time of the fall 2006 sampling (October 10, 2006) and summer 2007 sampling (August 7, 2007) occurred.

Table 3-13. Range of general water quality parameters measured in the West Branch Feather River by PG&E in the spring, summer, and fall 2006, and fall 2007. (Source: PG&E, 2007b)

| Parameter (units) | Spring 2006 | Summer 2006 | Fall 2006 | Summer 2007 |
|---|---|---|---|---|
| DO (mg/L) | 9.2-11.5 | 8.7-10.3 | 9.4-10.6 | 7.45-9.37 |
| DO (%) | 94-105 | 98-109 | 94-105 | 88-104 |
| Specific Conductivity (µS/cm at 25°C) | 32-70 | 61-90 | 86-108 | 61-104 |
| pH | 7.1-7.4 | 7.1-7.8 | 7.1-8.1 | 7.4-8.1 |
| Turbidity (NTU) | 0.5-2.1 | <0.5-1.0 | 0.2-0.4 | 0.3-1.4 |
| Water Temperature | 6.0-19.7 | 10.2-18.5 | 5.4-14.1 | 6.1-19.8 |
| Total Suspended Solids (mg/L) | ND-4.0 [J] | ND | ND | - |
| Total Dissolved Solids (mg/L) | ND[BA]-71 | ND[BA]-110 | 36[BA]-130 | 44-78 |
| Hardness as $CaCO_3$ (mg/L) | 13-100 | 19-41 | 35-45 | 34-45 |
| Total Alkalinity (mg/L) | 19-37 | 28-58 | 37 [JD] -61[JD] | 40-58 |
| Calcium (mg/L) | 3.1-28.0 | 4.1-10.0 | 9.7-11.0 | 11.0-12.0 |
| Magnesium (mg/L) | 1.2-8.6 | 1.8-3.8 | 2.3-4.3 | 3.0-5.0 |
| Potassium (mg/L) | ND-6.1 | ND | ND | 0.5[J]-2.0 [J] |
| Sodium (mg/L) | 0.4-81.0 | 1.0-3.5 | 1.2-3.8 | 1.0-4.0 |
| Chloride (mg/L) | 1.4 [J] | ND | ND-1.2 | 0.2[JD]-2.4 [JD] |
| Sulfate (mg/L) | ND | ND | ND-2.1 | 0.21 [J] -2.4 |
| Nitrate + Nitrite (mg/L) | ND-1.9 [J] | ND | ND | ND-0.1[BA] |
| Ammonia Nitrogen (mg/L) | ND | ND | ND | ND |
| Total Kjeldahl Nitrogen (mg/L) | ND [JD] -1.1 [JD] | ND [JD, BA]-2.2 [JD, BA] | ND [BA]-0.9 [BA] | ND-0.2 |
| Total Phosphorus (mg/L) | 0.015 [JD] | ND-0.066 | ND | ND-0.03 [J] |
| Orthophosphate (mg/L) | ND-0.011 | ND-0.02 | ND-0.095 | ND-0.02 [J] |
| Chlorophyll-a (mg/L) | 0.0013 | ND | ND | ND |
| Total Copper (µg/L) | 0.21 [J] -3.6 | ND-0.6 | 0.2 [J]-0.7 | NR |
| Dissolved Copper (µg/L) | 0.34 [J] -1.4 [J] | 0.3 [J] -0.8 | 0.2 [J] -0.6 | 0.4 [J] -1.3 |
| Total Nickel (µg/L) | ND-1.1 [J] | ND-0.9 [J] | 0.2 [J] -0.9 [J] | ND-0.8 [J] |
| Dissolved Nickel (µg/L) | ND-1.1 [J] | 0.2 [J] -0.8 [J] | 0.2 [J] -0.6 [J] | ND-1.1 [J] |

| Parameter (units) | Spring 2006 | Summer 2006 | Fall 2006 | Summer 2007 |
|---|---|---|---|---|
| Total Silver (µg/L) | ND | ND | ND | ND-0.6 |
| Dissolved Silver (µg/L) | ND | ND-0.1 [J] | ND | ND |
| Total Iron (µg/L) | ND-170.0 [J] | ND-54 | ND-129 | ND-107 |
| Total Manganese (µg/L) | 0.97 [J] -21.2 | 0.9-7.4 | 0.7-28 | 0.7-64.3 |

- No data collected

ND Result below laboratory MDL (method detection limit)

NR Data that were excluded during the quality control review are indicated as "NR" (not reported).

XJ Result below method reporting limits "MRL", but above laboratory MDL and reported here as a J-flag.

XBA Result adjusted based on equipment or filed blank result

XJD Duplicate results > MRL, but differed by 10 %, suggesting uncertainty

Table 3-14. Range of general water quality parameters measured in Butte Creek by PG&E in the spring, summer, and fall 2006, and fall 2007. (Source: PG&E, 2007b)

| Parameter (units) | Spring 2006 | Summer 2006 | Fall 2006 | Summer 2007 |
|---|---|---|---|---|
| DO (mg/L) | 9.9 -11.5 | 8.8-9.6 | 10.4-11.1 | 8.7-10.6 |
| DO (%) | 99-109 | 99-106 | 99-102 | 94-115 |
| Specific Conductivity (µS/cm at 25°C) | 35-59 | 88-116 | 102-133 | 68-101 |
| pH | 6.7-7.5 | 7.4-8.2 | 7.1-7.5 | 7.78-8.6 |
| Turbidity (NTU) | 1.2-42.6 | 0.4-1.3 | 0.3-1.2 | 0.9-2.2 |
| Water Temperature | 5.8-13.5 | 13.5-19.5 | 8.5-11.5 | 12.8-20.9 |
| Total Suspended Solids (mg/L) | ND-5.0 | ND-2.0 [BA, J] | ND | - |
| Total Dissolved Solids (mg/L) | 8 [BA] -31 [BA] | 7 [BA] -102 [BA] | 69 [BA] -93 | 66-98 |
| Hardness as $CaCO_3$ (mg/L) | 17-25 | 37-47 | 41-50 | 40-55 |
| Total Alkalinity (mg/L) | 24-43 | 50-75 | 57 [JD] -81 [JD] | 50-67 |
| Calcium (mg/L) | 4.4-5.8 | 9.2-11 | 10-12 | 12-14 |
| Magnesium (mg/L) | 1.6-2.5 | 3.4-4.7 | 3.6-5 | 4-6 |
| Potassium (mg/L) | ND | ND | ND | 1.0 |
| Sodium (mg/L) | 1.3-2.3 | 2.7-3.9 | 2.9-4 | 3-5 |

| Parameter (units) | Spring 2006 | Summer 2006 | Fall 2006 | Summer 2007 |
|---|---|---|---|---|
| Chloride (mg/L) | NR | ND-4.4 | ND-1.1 | 0.3-2.2 |
| Sulfate (mg/L) | ND | ND | 0.6-2.9 | 0.5 -2.2 |
| Nitrate + Nitrite (mg/L) | ND-0.7$^{J}$ | ND | ND | ND-0.1$^{BA}$ |
| Ammonia Nitrogen (mg/L) | ND | ND | ND | ND-0.03$^{J}$ |
| Total Kjeldahl Nitrogen (mg/L) | ND$^{JD}$ -1.1$^{JD}$ | ND$^{JD, BA}$-3.3$^{JD, BA}$ | ND$^{BA}$-0.9 | ND-0.1 |
| Total Phosphorus (mg/L) | NR | ND-0.063 | ND | ND |
| Orthophosphate (mg/L) | ND-0.01 | ND-0.1 | ND | ND-0.01$^{J}$ |
| Chlorophyll-a (mg/L) | NR | ND | ND | ND |
| Total Copper (µg/L) | 0.3$^{J}$ -1.8 | ND-0.2 | 0.2$^{J}$-0.3$^{J}$ | NR |
| Dissolved Copper (µg/L) | 0.31$^{J}$ -1.3$^{J}$ | 0.3$^{J}$ -0.6 | 0.3$^{J}$ -0.6 | 0.3$^{J}$ -1.7 |
| Total Nickel (µg/L) | 0.37$^{J}$ -1.4$^{J}$ | 0.2$^{J}$ -0.5$^{J}$ | 0.3$^{J}$ -0.6$^{J}$ | ND-0.7$^{J}$ |
| Dissolved Nickel (µg/L) | 0.29$^{J}$ -2.6 | 0.3$^{J}$ -0.6$^{J}$ | 0.2$^{J}$ -0.5$^{J}$ | ND-0.7$^{J}$ |
| Total Silver (µg/L) | ND-0.2$^{J}$ | ND | ND | ND-0.7$^{JD}$ |
| Dissolved Silver (µg/L) | ND | ND | ND | ND-0.2$^{J}$ |
| Total Iron (µg/L) | ND-120.0$^{J}$ | 30-111 | ND-46 | ND-105 |
| Total Manganese (µg/L) | 1.4$^{J}$ -9.7 | 0.8-8 | 0.8-3 | 1.2-7.6 |

| | |
|---|---|
| - | No data collected |
| ND | Result below laboratory MDL (method detection limit) |
| NR | Data that were excluded during the quality control review are indicated as "NR" (not reported). |
| $X^{J}$ | Result below minimum reporting limit (MRL), but above laboratory MDL and reported here as a J-flag. |
| $X^{BA}$ | Result adjusted based on equipment or filed blank result |
| $X^{JD}$ | Duplicate results > MRL, but differed by 10 percent, suggesting uncertainty |

The reservoir surveys included in situ profiles of basic water quality parameters, as well as grab samples for water chemistry, nutrients, and biological parameters, as described below. In order to represent reservoir water quality and water column structure, in situ measurements were taken throughout the water column. Grab samples for laboratory analysis were taken in both the epilimnion (near surface) and hypolimnion (1.6 feet from bottom) of the reservoir.

To assess impacts of recreational use on reservoir water quality, PG&E also collected samples once each during the Independence Day (July 3, 2006) and Labor Day (September 5, 2006) holiday weekends, and once on August 7, 2007. In 2006, surface grab samples were taken near the dam in Philbrook reservoir for hydrocarbons, and near sites with greater potential for localized fecal coliform contamination in Philbrook reservoir and DeSabla forebay. In 2007, Philbrook reservoir and DeSabla forebay were sampled for fecal coliform only. The sample sites were selected because of known recreational use, including sites near swimming, camping, and picnic areas with restroom facilities near the shore.

*Water Temperature*

Round Valley Reservoir – Round Valley reservoir is shallow, approximately 23 feet deep in spring when full, and was dry during fall 2006 and summer 2007 sampling. Water temperatures in Round Valley reservoir ranged from 10.3°C at 13 to 16.4 feet deep (spring 2006) to 21.3°C throughout (summer 2006). Water temperatures declined by approximately 1°C from the surface of the reservoir to the bottom in spring and remained uniform in temperature from surface to bottom during the summer.

Upper West Branch Feather River – Data collected by PG&E in 2004 through 2006 indicate that water temperatures in the upper West Branch Feather River are driven by the Coon Hollow Creek/Spring complex and to a limited extent releases from Round Valley reservoir. Managed releases from Round Valley reservoir are typically initiated in late June or early July and extend for one month into July or early August. Figure 3-9 compares daily average water temperatures from several stations in the upper West Branch Feather River upstream of the Philbrook Creek confluence for the 2006 monitoring period. Water temperature sampling locations are indicated in table 3-15. Mean daily water temperatures in the West Branch Feather River immediately downstream of Round Valley reservoir during the July through August period ranged from 17.5 to 24.1°C during the 2004 through 2006 monitoring efforts. However, water temperature in the West Branch Feather River downstream of the confluence with Coon Hollow/Spring Complex ranged from 6.2 to 13.5°C during the same period in 2004 through 2006. Releases from Round Valley can cause a slight increase (up to approximately 2°C) in West Branch Feather River water temperatures while being utilized to supplement West Branch Feather River flows during the early summer period. This influence is dependent upon the timing and magnitude of releases from Round Valley reservoir.

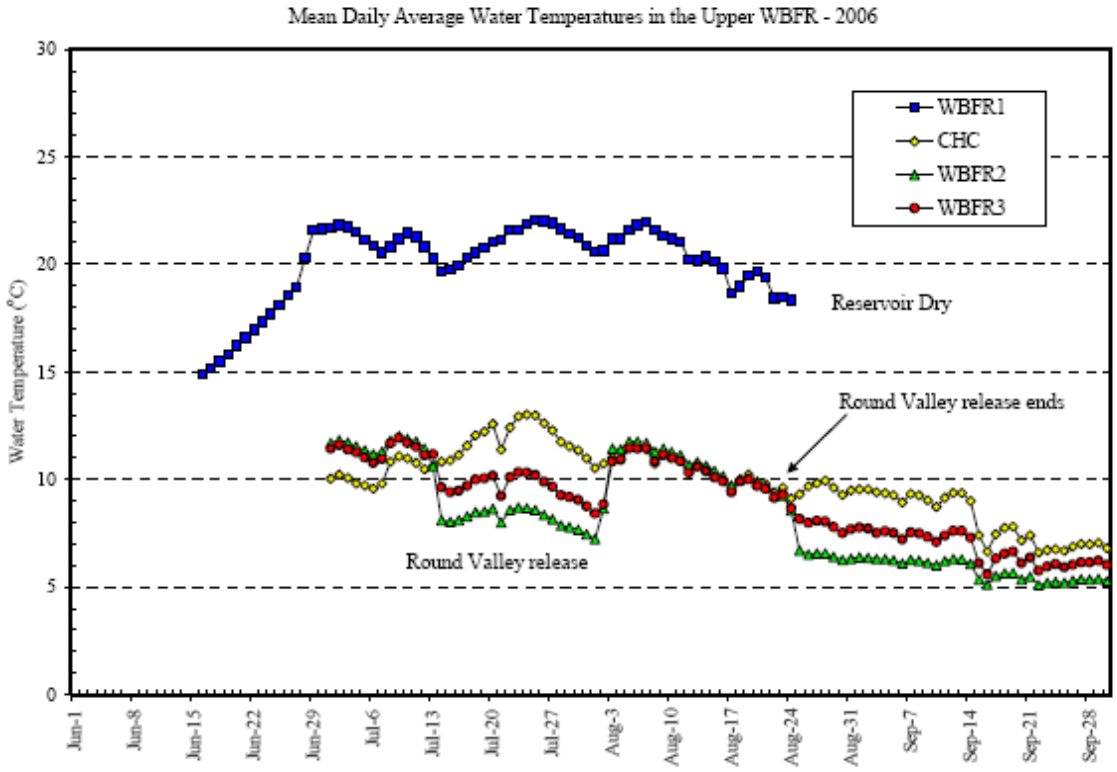


Figure 3-9. Comparison of daily average water temperatures from four stations in the upper West Branch Feather River during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

Table 3-15. Water temperature monitoring-model locations. (Source: PG&E, 2008b)

| Station Work Group | Station ID | Description |
|---|---|---|
| Upper West Branch Feather River | RVR | Round Valley reservoir |
| | WBFR1 | WBFR below Round Valley reservoir |
| | CHC | Coon Hollow Creek |
| | WBFR2 | WBFR below confluence with Coon Hollow Creek |
| | WBFR3 | WBFR above confluence with Philbrook Creek |
| | WBFR4 | WBFR below confluence with Philbrook Creek |
| | LCCrk | Last Chance Creek near mouth |
| | WBFR5 | WBFR at Hendricks diversion dam |
| Philbrook Creek | PC1 | Philbrook Creek above Philbrook reservoir |

| Station Work Group | Station ID | Description |
|---|---|---|
| | PCR | Philbrook reservoir |
| | PC2 | Philbrook reservoir below dam |
| | PC3 | Philbrook Creek at mouth |
| Hendricks-Toadtown canal | HTC1 | Hendricks canal at Long Ravine diversion |
| | HTC2 | Hendricks canal at Toadtown powerhouse (TTPH) |
| | HTC3 | Toadtown canal at BW-12 |
| | BTC2 | Butte canal above TTC (BW-15) |
| | BTC3 | Butte canal inflow to forebay |
| DeSabla forebay | DSFBY | DeSabla forebay |
| | DSPH | DeSabla powerhouse |
| Upper Butte Creek | BTC1/BC1 | Butte Creek at Butte diversion dam |
| | BC2 | Butte Creek above West Branch Butte Creek |
| | WBBC | West Branch Butte Creek |
| | BC3 | Butte Creek below West Branch Butte Creek |
| | BC5 | Butte Creek above DeSabla powerhouse |
| | BC6/LCC1 | Butte Creek at Lower Centerville diversion dam |
| Lower Butte Creek | BC7-A | Butte Creek at PG&E Pool 4 |
| | BC7-B | Butte Creek near Helltown Bridge |
| | BC7-C | Butte Creek near Harthorn property |
| | BC8 | Butte Creek above Centerville powerhouse |
| | LCC2 | Centerville powerhouse at Header box |
| | BC9 | Butte Creek below Centerville powerhouse |
| | BC10 | Butte Creek above Little Butte Creek confluence |
| Lower WBFR | WBFR8 | WBFR above Big Kimshew Creek |
| | BkCk1 | Big Kimshew Creek on US Forest Service property |
| | WBFR9 | WBFR below Big Kimshew Creek |
| | WBFR10 | WBFR above Fall Creek (RM 21.5) |
| | WBFR12 | WBFR above Little West Fork |

| Station Work Group | Station ID | Description |
|---|---|---|
| | LWF3 | Little West Fork near mouth |
| | WBFR13 | WBFR below Little West Fork |
| | WBFR14 | WBFR above Upper Miocene diversion (near RM 15) |
| Butte canal feeder diversions | InpCrk1 | Inskip Creek at diversion into Butte canal |
| | KlyCrk1 | Kelsey at diversion into Butte canal |
| | ClrCrk1 | Clear Creek at diversion into Butte canal |
| Hendricks/Toadtown canal feeder diversions | LngRav1 | Long Ravine above Hendricks tunnel |
| | LngRav3 | Long Ravine above Little West Fork |
| | CunRav1 | Cunningham Ravine above Hendricks canal |
| | CunRav2 | Cunningham Ravine above Little West Fork |
| | LWF1 | Little West Fork above Hendricks canal |
| | LWF2 | Little West Fork above Cunningham Ravine |

Philbrook Reservoir – Water temperatures measured in Philbrook reservoir ranged from 4.0 (52.5 feet deep, spring 2006) to 21.4°C (1.6 to 6.6 feet deep, summer 2006). Observed water temperature profiles indicate that Philbrook reservoir was stratified in spring and summer 2006, and in summer 2007, with the thermocline deepening by approximately 1.6 to 6.6 feet between the 2006 sampling events. By the time of the fall 2006 sampling event, the mixed layer extended to the bottom of the reservoir. The thermocline in summer 2007 was steeper and deeper (a 9.8°C decline between 39.4 and 45.9 feet deep in summer 2007, as opposed to a 8.7°C decline between 23.0 and 45.9 feet deep in summer 2006). Philbrook reservoir exhibits stronger thermal stratification than Round Valley reservoir due largely to the greater depth and hydraulic retention time. Thermal stratification in Philbrook reservoir is modified by the timing of management releases through the low-level outlet. Maximum stratification occurs in early summer and begins to decline as soon as management releases begin as shown in figure 3-10. Differences in drawdown rate or timing between 2006 and 2007 may account for the observed differences in the 2006 and 2007 summertime temperature profiles for Philbrook reservoir.

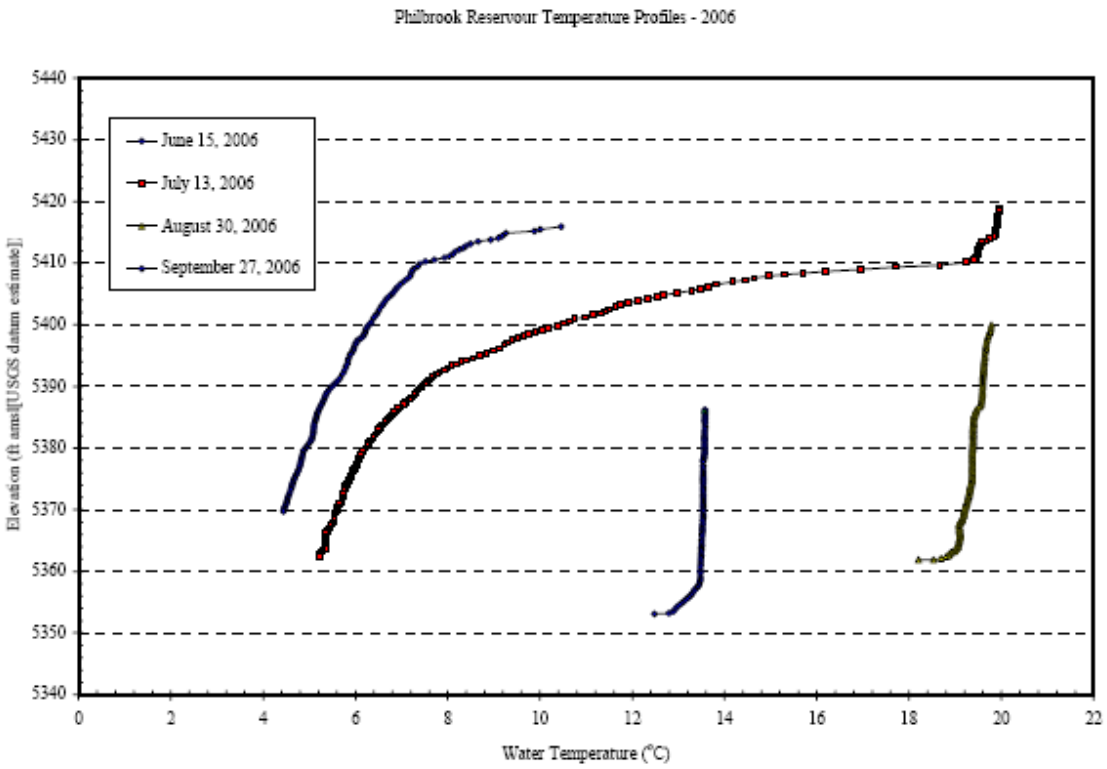


Figure 3-10. Comparison of monthly water temperature profiles from Philbrook reservoir during the 2006 monitoring period. (Source: PG&E, 2008b)

Philbrook Creek – Water temperatures in Philbrook Creek are driven by conditions in Philbrook reservoir. During non-spill periods, all flows in lower Philbrook Creek are derived from releases originating from the low-level reservoir release at the main dam. As a result, water temperatures immediately downstream of the dam have a small diel fluctuation and correspond to temperatures in the hypolimnion of the Philbrook reservoir. As management releases are initiated and the small supply of cool water in the reservoir is depleted, release water temperatures begin to increase. The peak release water temperature typically occurs in late August or September and can exceed 20°C. Water temperatures near the confluence of Philbrook Creek with the West Branch Feather River vary temporally compared with conditions downstream of Philbrook reservoir dam. Factors affecting this variability include, spill from Philbrook reservoir (warmer water), magnitude of management release, duration and timing of releases, as well as accretion occurring between the reservoir and the downstream monitoring station. Typically, conditions in Philbrook Creek near its mouth are warmer than those in the West Branch Feather River upstream of the confluence.

Figure 3-11 compares the daily average water temperatures from several stations in Philbrook Creek for the 2006 monitoring period and illustrates the cooling effect in

Philbrook Creek once releases from Philbrook reservoir are initiated. Mean daily water temperatures in Philbrook Creek near the confluence with the West Branch Feather River during the July through August period ranged from 8.4 to 18.8°C for the 2004 through 2006 monitoring efforts. For comparison, water temperature data from the West Branch Feather River upstream of Philbrook Creek had mean daily water temperatures during the July through August period that ranged from 7.5 to 13.3°C.

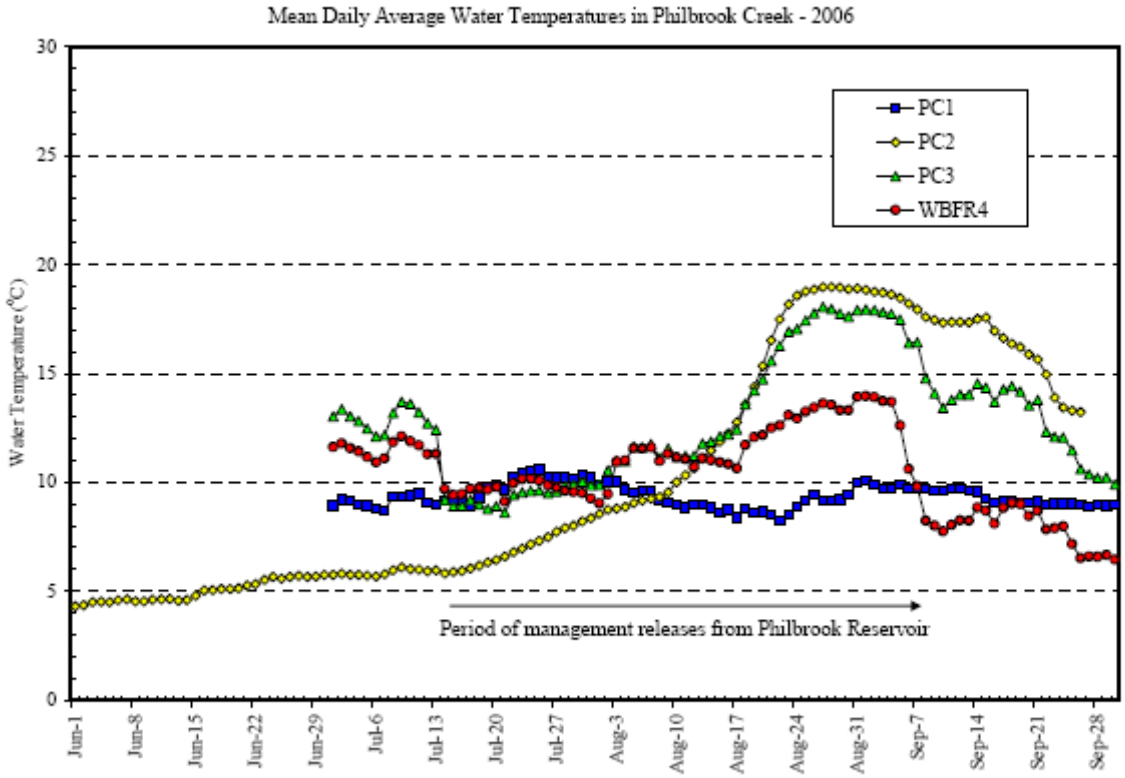


Figure 3-11. Comparison of daily average water temperatures from three temperature monitoring stations in Philbrook Creek and one station in the West Branch Feather River during the June through September 2006 period. (Source: PG&E, 2008b)

Middle West Branch Feather River – As flows in the West Branch Feather River move through the channel between the confluence of Philbrook Creek and Hendricks diversion dam, water temperatures in the July through August period typically increase 2 to 4 °C. The long travel time (approximately 13 hours at 80 cfs; PG&E, 1994) is such that the effect of upstream management manipulations are often masked or minimized in this reach. Two creeks enter this reach, Fish and Last Chance creeks (figure 1-2). Figure 3-12 compares the daily average water temperatures from stations in the West Branch Feather River, Philbrook Creek, and Last Chance Creek, between Philbrook Creek and

Hendricks diversion dam for the 2006 monitoring period. Figure 3-12 again demonstrates the cooling effect of flow releases from Philbrook reservoir. Water temperature data from the West Branch Feather River at Hendricks diversion dam indicate that mean daily water temperatures during the July through August period ranged from 12.4 to 17.0°C during the 2004 through 2006 monitoring efforts.

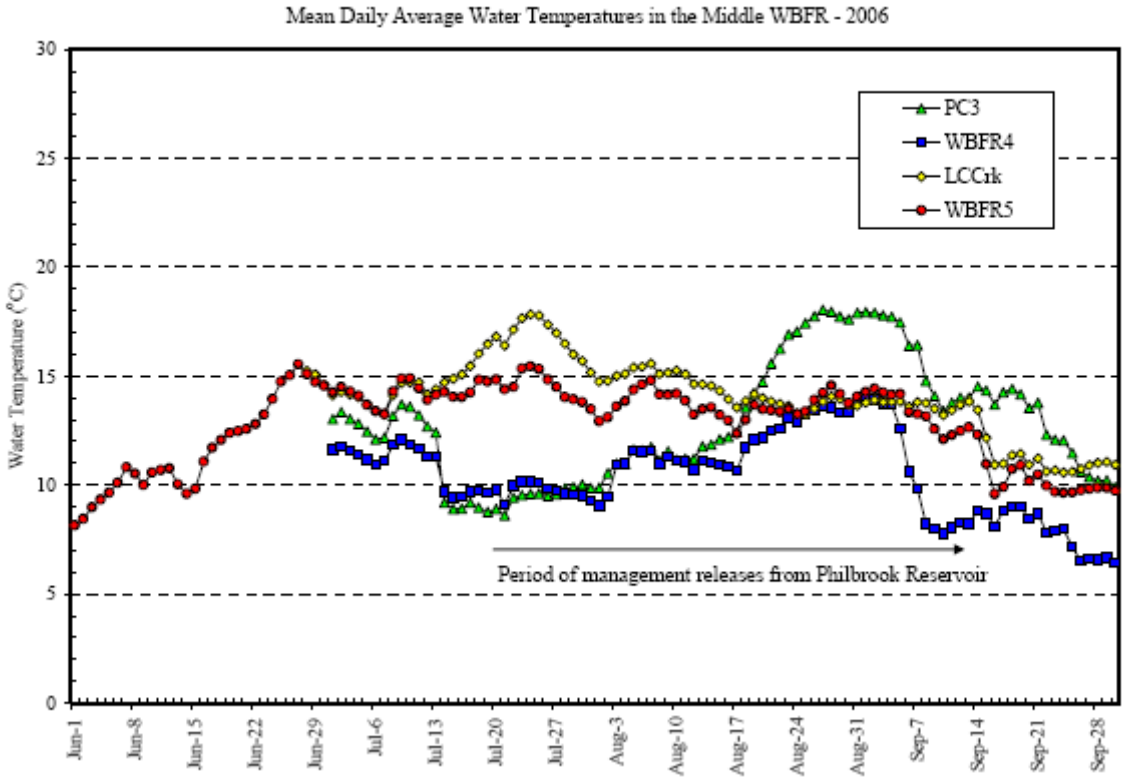


Figure 3-12. Comparison of daily average water temperatures from stations in the middle West Branch Feather River reach during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

In order to quantify conditions in the West Branch Feather River at Hendricks diversion dam, a frequency distribution analysis was performed using PG&E's 2004 through 2006 water temperature database. This information indicates that 77 percent of daily average water temperatures in the July through August period were less than 15°C; with 100 percent of daily average water temperatures during the same period less than or equal to 17°C.

Lower West Branch Feather River – Conditions in the lower West Branch Feather River downstream of Hendricks diversion dam are driven by the inflow from several major tributary streams. The largest of these, Big Kimshew Creek, enters the West Branch Feather River approximately 7 miles downstream of Hendricks diversion dam. A

second large tributary, the Little West Fork, enters the West Branch Feather River in the middle of the reach. Conditions in the West Branch Feather River upstream of PG&E's non-project Upper Miocene diversion (13.3 miles downstream of Hendricks diversion dam) represent the most downstream area in the West Branch Feather River affected by project operations. Mean daily water temperatures at this location during the July to August 2005 through 2006 period ranged from 17.2 to 22.7°C.

Mean daily water temperatures from the monitoring stations in the lower West Branch Feather River for the 2006 monitoring effort are compared in figure 3-13. This figure highlights the influence of inflow from the various large tributaries and the effect of the long travel time on water temperatures in this reach of the West Branch Feather River. Mean daily water temperatures in the West Branch Feather River upstream of PG&E's non-project Upper Miocene diversion during the July through August 2007 period ranged from 18.3 to 22.8°C, similar to temperatures observed during the same period in 2005 and 2006.

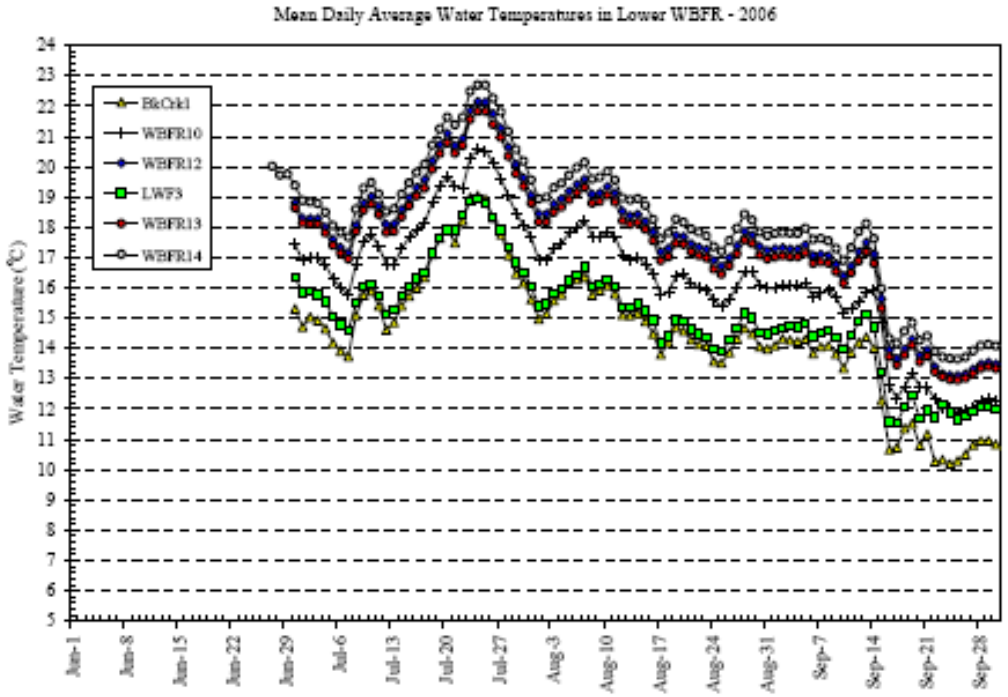


Figure 3-13. Comparison of daily average water temperatures from stations in the lower West Branch Feather River during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

Hendricks-Toadtown Canal – Flows are diverted from the West Branch Feather River into the Hendricks-Toadtown canal where they travel through the system relatively quickly and, as a result, do not exhibit a significant change in water temperature (less

than 1°C). Water temperature data from Hendricks/Toadtown canal near its confluence with Butte canal indicate that mean daily water temperatures during July through August ranged from 12.7 to 17.6°C during the 2004 through 2006 monitoring efforts.

Flows in the Hendricks canal are supplemented by diversions from three feeder creeks, all of which are tributaries to Little West Fork Creek. These diversions are small and on average the contribution from each is less than 3 cfs during the summer period. Long Ravine is the first of the feeder creeks diverted into Hendricks canal. This diversion is active all year long as it is used to re-divert flows back into the canal following release from Hendricks Tunnel. The second feeder diversion, on Cunningham Ravine about 2.6 miles downstream of the Long Ravine diversion, is only active during the non-runoff period. The third feeder diversion is located on Little West Fork Creek, located about 3.5 miles downstream of the Long Ravine diversion, and is only active during the non-runoff period. During the 2005 through 2006 monitoring efforts, only locations upstream of the diversion facilities were monitored. During the 2005 through 2006 monitoring period, all Hendricks canal feeder diversions were active with leakage and minimum release flows remaining in the tributaries downstream of the diversion dams. Figure 3-14 shows the daily average water temperatures from all three active feeder diversions on the Hendricks canal system from 2006 temperature monitoring. The data in these figures show that average water temperatures at all three streams are similar.

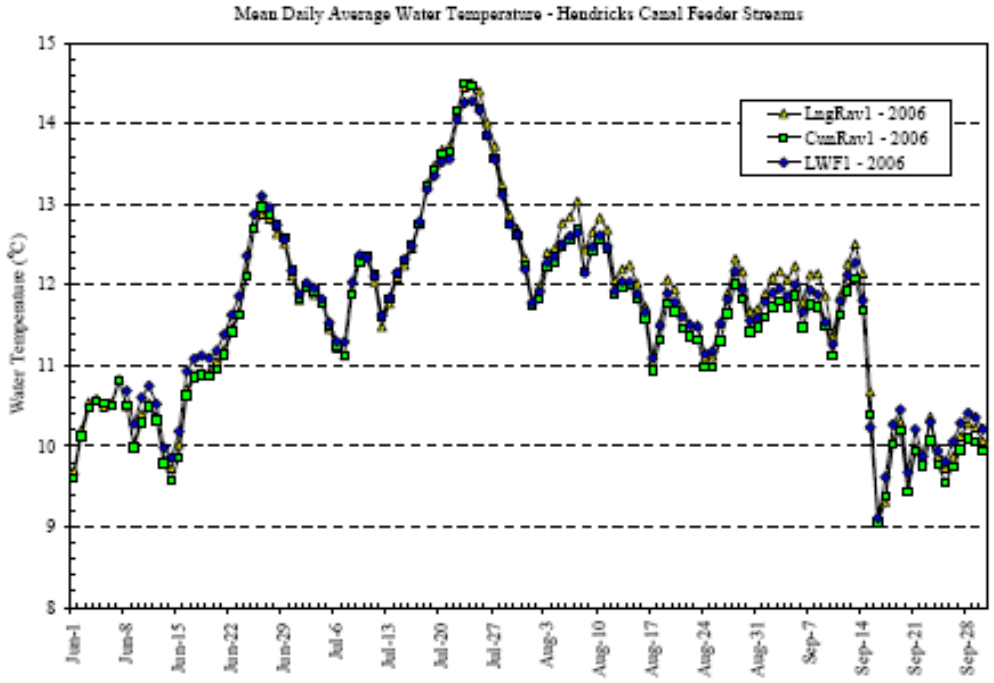


Figure 3-14. Comparison of daily average water temperatures from stations in the three Hendricks canal feeder creeks during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

Butte Canal – Flows from upper Butte Creek are diverted at the Butte Creek diversion dam. These flows are passed through the Butte canal system quickly and as a result do not exhibit a significant change in water temperature (less than 1°C). Flows from the West Branch Feather River (Hendricks-Toadtown canal) are mixed with Butte canal upstream of DeSabla forebay. Water temperature data from Butte canal upstream of the confluence with Toadtown canal indicate that mean daily water temperatures during the July through August period ranged from 12.9 to 18.0°C during the 2004 through 2006 monitoring efforts.

Flows in the Butte canal are supplemented by diversions from three feeder creeks. All of these feeder creeks are tributaries to Butte Creek downstream of Butte Creek diversion dam (figure 1-2). Inskip Creek is the first of the feeder creeks diverted into Butte canal and is located approximately 0.5 mile downstream of Butte Creek diversion dam. Kelsey Creek is the second of the active feeder creeks diverted into Butte canal and is located approximately 2 miles downstream from Butte Creek diversion dam. Clear Creek is the third and final feeder creek on Butte canal and is located 3.7 miles downstream of Butte Creek diversion dam. During the 2005 through 2006 monitoring period only Inskip and Clear Creek diversions were active with leakage and minimum release flows remaining in these tributaries to Butte Creek. Figure 3-15 compares mean daily water temperatures from the three active feeder creeks on the Butte canal system during 2006 monitoring and indicates that these streams have similar thermal regimes.

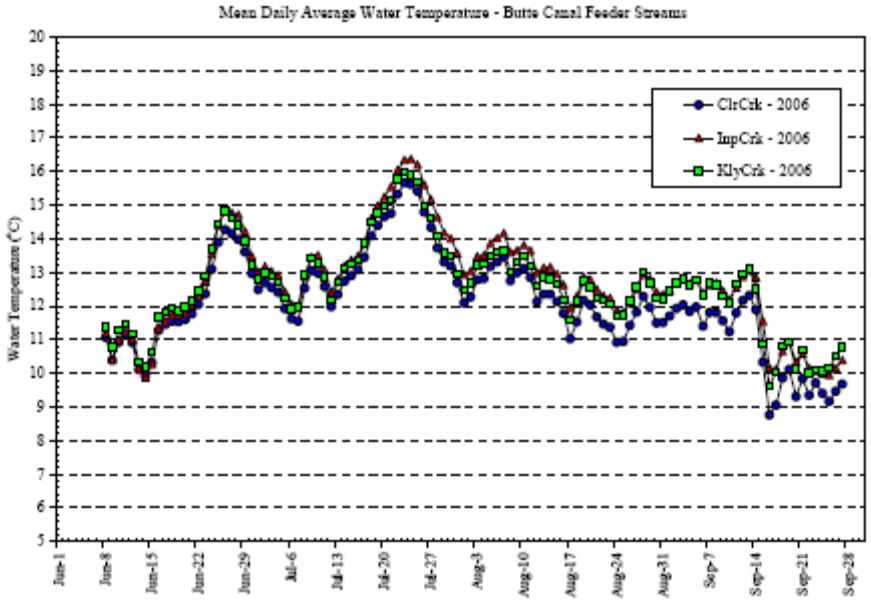


Figure 3-15. Comparison of daily average water temperatures from stations in the three Butte canal feeder creeks during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

Upper Butte Creek – The total length of the bypassed reach between Butte Creek diversion dam and DeSabla powerhouse (upper Butte Creek reach) is about 11 miles. PG&E monitored water temperature from 2004 through 2006 at four locations including: Butte Creek upstream of the confluence with the West Branch Butte Creek, the West Branch Butte Creek near its confluence with Butte Creek, Butte Creek downstream of West Branch Butte Creek, and Butte Creek upstream of DeSabla powerhouse.

Mean daily water temperatures in Butte Creek downstream of Butte Creek diversion dam during the July through August period ranged from 11.7 to 17.2°C during the 2004 through 2006 monitoring efforts. Mean daily water temperatures in Butte Creek upstream of the confluence with the West Branch Butte Creek ranged from 15.0 to 20.4°C for the July through August period in 2004 and 2005; 2006 data was not available. Figure 3-16 shows temperature monitoring results from 2006 in the upper Butte Creek reach and illustrates thermal warming that occurs downstream of the Butte Creek diversion dam.

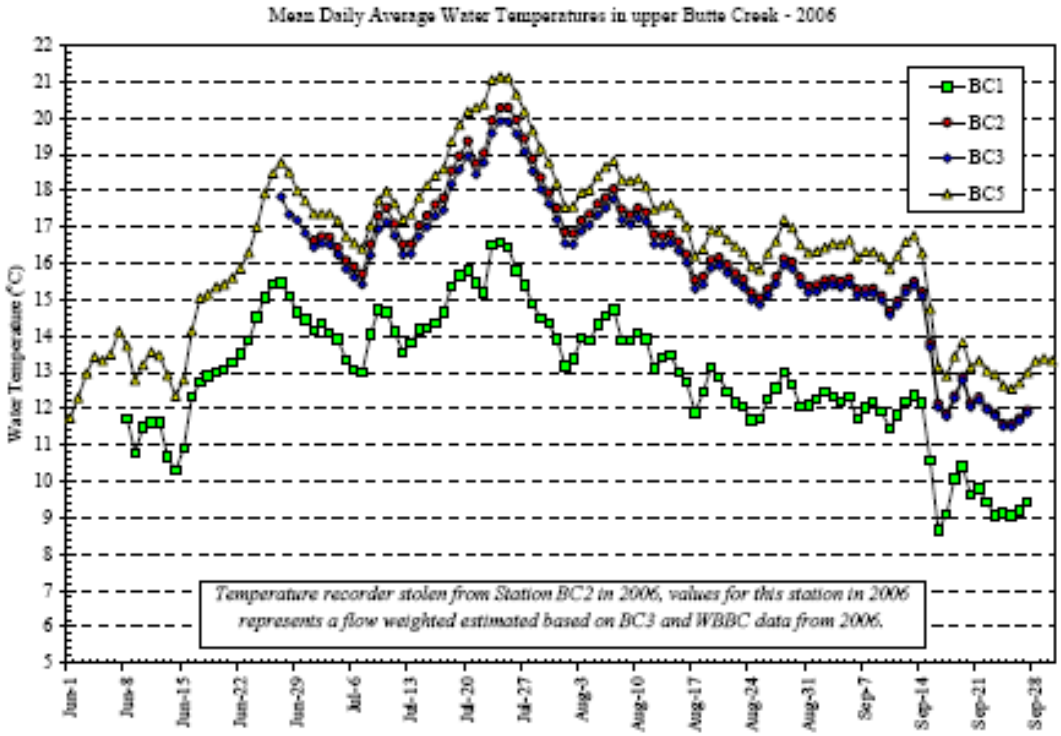


Figure 3-16. Comparison of daily average water temperatures from stations in the upper Butte Creek reach during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

The West Branch Butte Creek is the largest tributary in the upper Butte Creek reach. Water temperature data from the West Branch Butte Creek indicate that mean

daily water temperatures during the July through August period ranged from 13.7 to 18.4°C for the 2004 through 2006 monitoring efforts.

The most downstream location in the upper Butte Creek reach monitored for water temperature was at a station just upstream of DeSabla powerhouse. This station was situated downstream of the Forks of Butte powerhouse and therefore captured periods when this facility was in operation. Typically, end of operation at Forks of Butte powerhouse coincides with the end of spill flows in the upper Butte Creek Reach. Data from this location indicate that mean daily water temperatures during the July through August period ranged from 15.8 to 21.5°C for the 2004 through 2006 efforts.

DeSabla Forebay and DeSabla Powerhouse – The combined flow from Butte and Toadtown canals discharges directly into DeSabla forebay. DeSabla forebay acts as a regulating facility for the DeSabla powerhouse. Maximum canal flow into DeSabla forebay is approximately 191 cfs. Mean daily water temperatures in Butte canal upstream of DeSabla forebay during the July to August 2004 through 2006 monitoring periods ranged from 12.7 to 17.8°C.

In order to characterize water temperatures entering DeSabla forebay, a frequency distribution analysis was performed using PG&E's 2004 through 2006 water temperature database. The results of the frequency analysis indicate that 82 percent of daily average water temperatures in the July through August period for Butte canal were less than 16°C; with 100 percent of daily average water temperatures during the same period less than or equal to 18°C. Similarly, 73 percent of daily average water temperatures for the DeSabla powerhouse were less than or equal to 17°C; with 100 percent of the daily average water temperatures less than or equal to 19°C. This indicates a shift, of approximately 1°C, in the July through August water temperature as the water passes through DeSabla forebay.

PG&E collected vertical water temperature profiles from the DeSabla forebay in 2004 through 2006. Figure 3-17 shows the monthly water temperature profiles during the 2006 monitoring efforts.

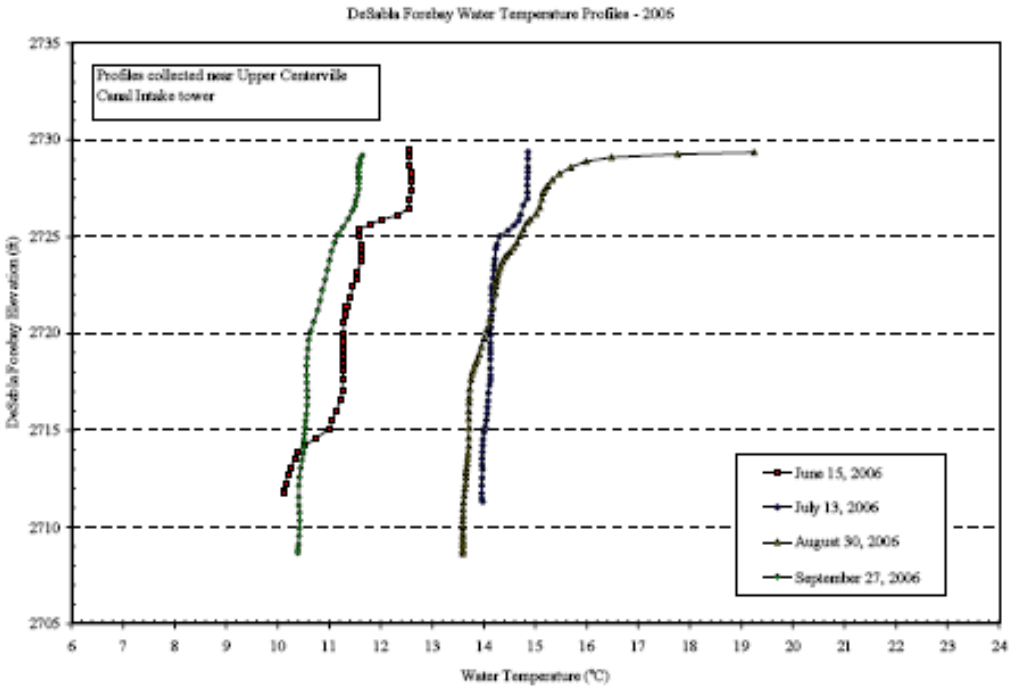


Figure 3-17. Comparison of monthly water temperature profiles from DeSabla forebay during 2006 water temperature monitoring. (Source: PG&E, 2008b)

DeSabla powerhouse is fed by DeSabla forebay through a welded steel penstock (maximum capacity of approximately 200 cfs) and discharges directly into Butte Creek, 0.2 mile upstream of Lower Centerville diversion dam. During the July to August (2004 through 2006) monitoring periods, mean daily water temperatures at DeSabla powerhouse ranged from 13.9 to 19.0°C.

Water temperature changes associated with DeSabla forebay have long been the subject of discussion as a means for reducing water temperatures downstream of Lower Centerville diversion dam for the benefit of spring-run Chinook salmon. Water temperature increases within DeSabla forebay occur as a result of increased residence time and greater surface area than in the canal sections upstream. Based on data collected by PG&E during the 2004 through 2006 monitoring programs, average water temperatures increased by 1.1°C within the DeSabla forebay during the July through August period. PG&E states this water temperature increase is consistent with previous monitoring efforts.

Lower Butte Creek – Conditions in Butte Creek at the Lower Centerville diversion dam are the result of mixed West Branch Feather River and Butte Creek diversions following passage through DeSabla forebay and flows remaining in Butte Creek downstream of Butte Creek diversion dam. Most of these combined flows are redirected into Lower Centerville canal and transported to Centerville powerhouse. Lower

Centerville canal has a short travel and therefore little change in water temperature (less than 1°C) occurs as flows move through this part of the system (low per mile thermal loading). During the July through August monitoring periods in 2004 through 2006, mean daily water temperatures in Lower Centerville canal upstream of Centerville powerhouse ranged from 14.8 to 20.3°C.

A minimum instream flow of 40 cfs is released downstream of the Lower Centerville diversion dam to the lower bypassed reach of Butte Creek (Centerville Reach). This reach is not supplemented with flows from any major tributaries. As flows move through the natural Butte Creek channel between the Lower Centerville diversion dam and Centerville powerhouse, water temperatures can increase between 2 to 4°C. Water temperature data from the Lower Centerville diversion dam indicate that mean daily water temperatures during the July through August period ranged from 14.4 to 19.6°C for the 2004 through 2006 monitoring efforts. This represents initial conditions in the Centerville Reach of Butte Creek. Mean daily water temperatures at the downstream end of the Centerville Reach (upstream of Centerville powerhouse) ranged from 17.4 to 23.0°C for the 2004 through 2006 monitoring efforts.

Flows from Centerville powerhouse are discharged directly into Butte Creek. Conditions downstream of Centerville powerhouse are the result of mixing canal flows with those from the Centerville Reach bypass section. Under normal operating conditions, water temperatures immediately downstream of Centerville powerhouse are similar to those observed near the half-way point of the Centerville Reach. During the July to August monitoring periods in 2004 through 2006, mean daily water temperatures in Butte Creek immediately downstream of Centerville powerhouse ranged from 15.8 to 21.2°C. Mean daily water temperatures from the monitoring stations in lower Butte Creek during the 2006 monitoring period are compared in figure 3-18 and highlight the influence of the long travel time (approximately 20 hours for 45 cfs; [PG&E, 1994]) on water temperatures in the Centerville Reach of Butte Creek.

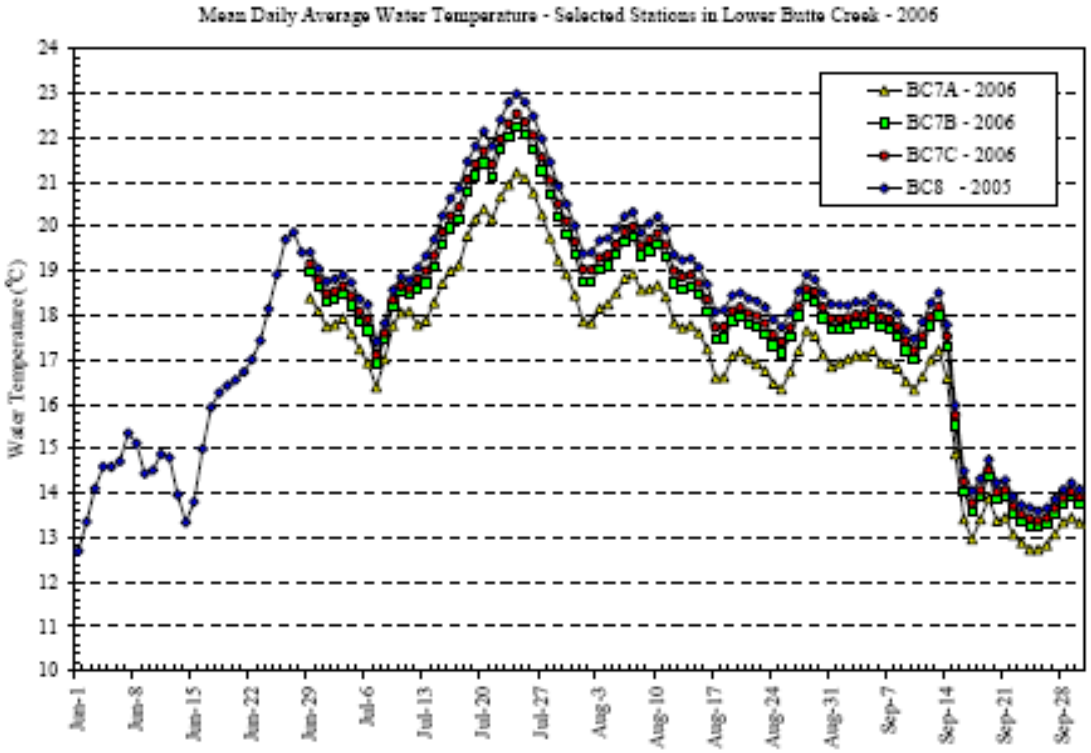


Figure 3-18. Comparison of daily average water temperatures from stations in the lower Butte Creek reach during the June through September 2006 monitoring period. (Source: PG&E, 2008b)

To quantify conditions in Butte Creek in the vicinity of Centerville powerhouse, a frequency distribution analysis was performed using PG&E's 2004 through 2006 water temperature database. This frequency analysis indicates 27 percent of daily average water temperatures downstream of Centerville powerhouse for the July through August period were less than 18°C; with 89 percent of daily average water temperatures during the same period less than or equal to 20°C. Conversely, only 2 percent of daily average water temperatures in the July through August period upstream of Centerville powerhouse were less than 18°C; with 45 percent of daily average water temperatures during the same period less than or equal to 20°C. This shows the cooling influence of Lower Centerville canal water on Butte Creek flows downstream of the powerhouse. In 2004 through 2006, Butte Creek downstream of Centerville powerhouse averaged 1.1°C cooler than the creek upstream of the powerhouse, during the July to August period.

*Water Temperature Modeling*

PG&E parameterized two sets of models to evaluate water temperature in the streams impacted by the project. Ten CE-QUAL-W22.v.3.2 (W2) water temperature models were developed for the stream reaches that directly affect lower Butte Creek (i.e., downstream of Lower Centerville diversion dam) and are operationally adjusted to

control water temperatures in spring-run Chinook salmon summer holding habitat. These locations include the West Branch Feather River upstream of Hendricks diversion dam, Hendricks/Toadtown canal, DeSabla forebay, and lower Butte Creek from DeSabla powerhouse to Centerville powerhouse (figure 3-19). The W2 model is a two-dimensional, laterally averaged, hydrodynamic and water quality model which has been applied to rivers, lakes, reservoirs, estuaries, and combinations thereof. The W2 temperature model was chosen because it is well suited to handle the combination of reservoirs, stream sections, canals, powerhouses, and diversion reaches characteristic of this project.[33]

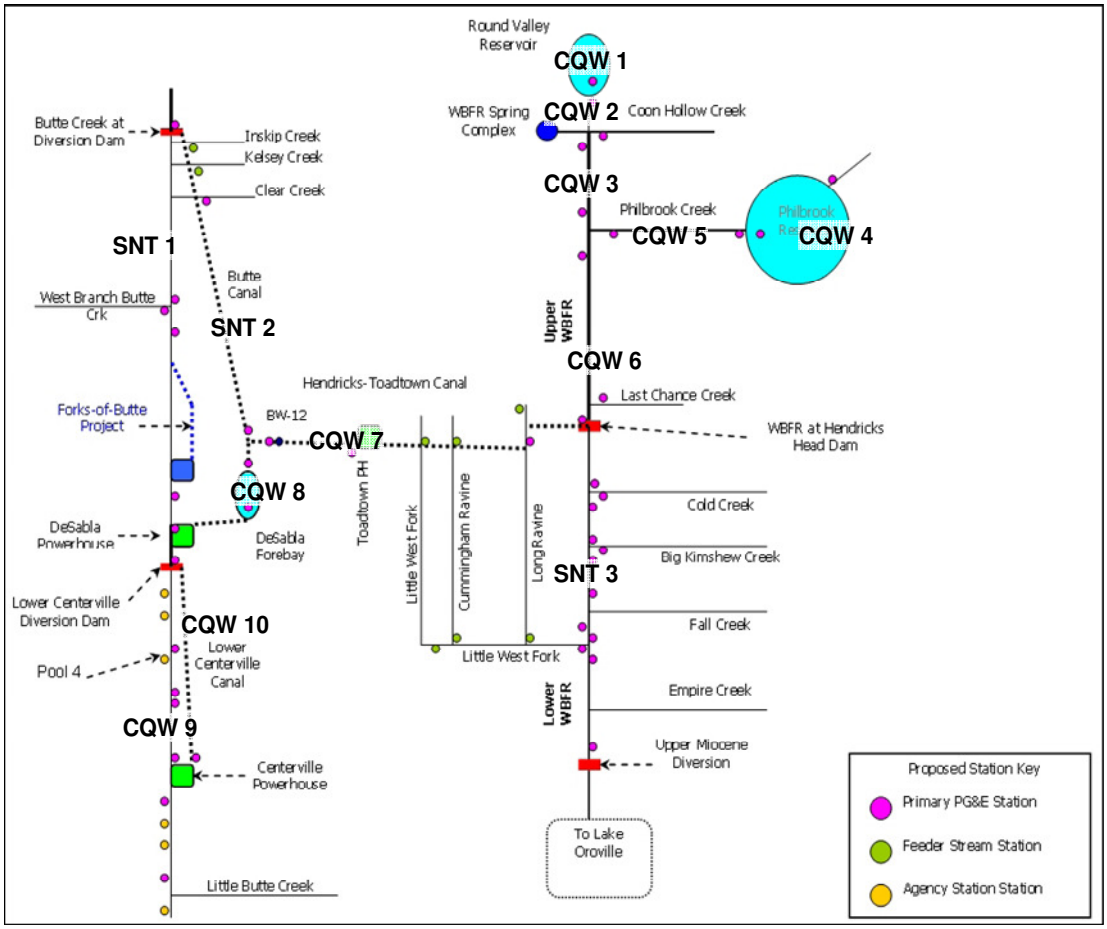


Figure 3-19. DeSabla-Centerville system temperature model configuration for CE-QUAL-W2 and SNTEMP water quality modeling. (PG&E, 2007a, as modified by staff)

[33] Additional information about the W2 temperature model can be found in the license application filed on October 2, 2007 (PG&E, 2007a).

For the three less complex stream reaches (i.e., upper Butte Creek, Butte canal, and Lower West Branch Feather River), models were developed using the Stream Temperature Model for Windows (StreamTemp), an adaptation of the Stream Network Temperature (SNTEMP) program by the USGS (figure 3-19). The lower West Branch Feather River and upper Butte Creek reaches are affected by minimum instream flow releases at their respective diversion structures and are not subject to operational fluctuations in flow related to management of water temperatures to protect spring-run Chinook salmon. The model uses identical algorithms as the SNTEMP model, but includes improved reports and graphs of program results, and employs a steady-flow, dynamic water temperature algorithm to determine the mean daily water temperature in a study reach.[34]

Our evaluation of the calibration and validation models provided by PG&E suggest that the models were parameterized correctly and are useful for evaluating the various flow alternatives as discussed below.

*Dissolved Oxygen*

During relicensing studies conducted by PG&E in 2006 and 2007, overall DO concentrations in Butte Creek ranged from 8.7 to 11.5 mg/L and overall DO concentrations in West Branch Feather River ranged from 7.45 to 11.5 mg/L (tables 3-13 and 3-14).

Concentrations of DO in Round Valley reservoir from sampling in 2006 ranged from 7.0 mg/L (6.6 feet deep, summer) to 9.2 mg/L (9.8 feet deep, spring).

Concentrations of DO in Philbrook reservoir from sampling in 2006 and 2007 ranged from < 1mg/L (45.9 to 55.8 feet deep, summer) to 12 mg/L (32.8 feet deep, summer). Profiles of DO indicated metalimnetic maximums near 26.2 feet deep in spring and summer 2006 and were constant with depth in fall 2006. In summer 2007, DO concentrations were highest in the epilimnion and decreased to <1 mg/L in the hypolimnion. Since nutrient and chlorophyll-a observations were consistently low in Philbrook reservoir, the development of low oxygen conditions in the hypolimnion suggests that a highly stable thermal stratification may have persisted for several months in 2007, with a slow, steady depletion of DO in bottom waters during that period. DO saturation ranged from 8 (45.9 feet deep, summer 2007) to 148 percent within the summer 2006 metalimnetic DO maximum (29.5 feet deep).

[34] Additional information about the SNTEMP temperature model can be found in the license application filed on October 2, 2007 (PG&E, 2007a).

In DeSabla forebay, concentrations of DO measured in 2006 and 2007 ranged from 7.38 (3.3 feet deep, summer 2007) to 11.5 mg/L (16.4 feet deep, spring 2006). DO saturation ranged from 82 (3.3, 6.6, 9.8, and 16.4 feet deep, summer 2007) to 106 percent (9.8 feet deep, fall 2006). Profiles of DO were relatively constant with depth, but showed a slight increase in DO from surface to near-bottom waters during all sampling events.

*Turbidity*

Turbidity was low during all routine 2006 and 2007 sampling events, ranging in Butte Creek from 0.3 (fall 2006) to 3.9 NTU (spring 2006) (table 3-14). Across all seasons in 2006, there was a general longitudinal increase in turbidity from upstream to downstream in Butte Creek, while in summer 2007 turbidity was highest in Butte Creek upstream of DeSabla powerhouse and decreased by approximately 1 NTU progressing downstream to the site upstream of Centerville powerhouse.

Turbidity in the West Branch Feather River was low during all 2006 sampling events, ranging from 0.2 to 2.1 NTU (spring) (table 3-13). Turbidity generally decreased from upstream to downstream stations in 2006. Two stations, including one in Hendricks canal and one upstream of the non-project Miocene diversion were exceptions to this pattern, exhibiting increased turbidity as compared to upstream stations during all sampling events. In 2007, turbidity was less than 1 NTU for all the West Branch Feather River stations and was within the range of turbidity observed in 2006. No longitudinal trend in 2007 turbidity data was observed.

In Round Valley reservoir, Secchi depth exceeded the reservoir depth during both trips. Turbidity was low throughout, ranging from 0 (6.6 and 9.8 feet deep, spring) to 1.1 NTU (3.3 feet deep, summer).

In Philbrook reservoir, Secchi depth for fall 2006 is not reported because high winds and surface waves impeded both visibility and the ability to maintain a vertical cast. Secchi depth for summer 2007 was not recorded. With the exception of reservoir bottom in summer 2007, turbidity was low during all sampling events, ranging from 0 (several depths) to 27.3 NTU (55.8 feet deep, summer, 2007). During 2006, turbidity increased with depth in spring and remained relatively constant with depth in fall. Turbidity in summer 2006 reached a maximum just above thermocline. In summer 2007, layers of slightly elevated turbidity (1.7–2.4 NTU) over background levels (0.8–1.3 NTU) were observed at 9.9 to 16.4 feet deep and 32.8 and 45.9 feet deep. More elevated levels of turbidity (up to 27.3 NTU) were observed in the bottom two meters of the reservoir, but these elevated levels may have been due to sediment kicked up by the sampler contacting the reservoir bottom.

In DeSabla forebay, turbidity was low during all 2006 sampling events, ranging from 0 (13.1 and 16.4 feet deep, fall) to 2.6 NTU (9.8 to 13.1 feet deep, spring). However, turbidity was substantially higher in summer 2007, ranging from 17.2 NTU at

1.6 feet deep to 20.4 NTU at 19.7 feet deep. As 2007 chlorophyll-*a* and nutrient concentrations for DeSabla forebay were low, the increased turbidity observed in 2007 did not appear to be related to algal growth in the water column. Secchi depths ranged from 17.7 feet deep (summer 2007) to 22.6 feet deep (spring 2006). In 2006, Secchi depths in DeSabla forebay were slightly lower than those measured in Philbrook reservoir, however the presence of submerged aquatic vegetation in DeSabla forebay may have reduced the accuracy of these readings.

*Turbidity Monitoring During Scheduled and Unscheduled Canal Outages*

Targeted turbidity monitoring was conducted on eight occasions during 2006, including four planned operational outages for scheduled Butte canal debris cleanup or routine maintenance of Centerville powerhouse, and four unscheduled operational outages when the powerhouse tripped off-line. During most turbidity sampling events, background samples were collected once per day from sites upstream of the powerhouse canals and compliance samples were collected downstream of the canal confluence approximately every hour until conditions returned to near background or sampling was deemed unsafe (e.g., darkness).

Turbidity was low throughout 2006 and 2007 at all stations (<4 NTU), except for two occasions on which unscheduled outages occurred in Butte canal, resulting in turbidity levels of 43 and 19 NTUs. The relatively high turbidity levels measured following these two unscheduled outages were reduced to near background levels within 24 and 4 hours, respectively. However, the elevated turbidity observed during both of these unscheduled outages exceeds the Basin Plan criteria of <1 NTU increase. Four other scheduled or unscheduled canal outages produced downstream turbidity increases >1 NTU during 2006, however peak turbidity was relatively lower, ranging from 3.4 to 7.1 NTU with recovery times below 4 to 5 hours.

Although the two highest turbidity levels observed in 2006 occurred during unscheduled outage events, the historical data record indicates that turbidity increases occurred during both scheduled and unscheduled canal outages. Generally, the unscheduled outage events occurred during summer and fall months when background turbidity is naturally low, which resulted in exceedances of the Basin Plan objective of <1 NTU increase in all but one event (October 7, 2004). Scheduled operational outages took place mainly during winter and spring months when seasonal storm events are likely to transport higher sediment loads through project streams. Despite the potential for higher allowable increase in turbidity at higher background levels (e.g., 10 NTU allowable increase for background measurement from 50 to 100 NTU), there was only one scheduled canal outage during naturally high turbidity conditions (February 28, 2006) and most events exceeded Basin Plan water quality objectives in one or more samples.

*Fecal Coliform*

Sampling for fecal coliform was conducted in Philbrook reservoir and DeSabla forebay during all sampling events. Fecal coliform values ranged from below laboratory detection limits to >3,000 CFU/100 mL. High fecal coliform levels were measured in DeSabla forebay during spring (1600 CFU/100 mL), Independence Day Weekend (>2420 CFU/100 mL), summer 2006 (668 CFU/100 mL), as well as during a follow-up sampling event conducted in response to the high 2006 summer results (>1,600 CFU/100 mL). High levels of fecal coliform were also measured in DeSabla forebay at the eastern shore sites, ranging from 450 CFU/100 mL to 830 CFU/100 mL in summer 2007.

The Basin Plan includes a water quality objective for fecal coliform bacteria in waters designated for contact recreation. The Basin Plan objective for fecal coliform is a geometric mean of < 200 MPN per 100 mL of water from five samples within a 30 day period and < 400 MPN per 100 mL in 10 percent of all samples taken within a 30-day period. However, because no five samples were collected within the same 30-day period in 2006, the five sample geometric mean objective cannot be calculated to evaluate compliance with the objective during that year. However, individual samples from DeSabla forebay exhibited fecal coliform concentrations above 200 MPN (or CFU)/100 mL on a one-time basis during spring, Independence Day and summer sampling events. Also, individual samples at this site were also greater than 200 MPN/100 mL during follow-up sampling conducted in response to the high results from the spring and summer events. DeSabla forebay samples were also above 400 CFU per 100 mL in 100 percent of samples taken between spring and summer events. Finally, the geometric mean of the four samples collected at this site during the 42 day period between July 3 and August 14, 2006, was 1,127 CFU/100 mL, or greater than 200 MPN per 100 mL. Thus, while sampling protocol did not allow evaluations versus water quality objectives, high fecal coliform levels in DeSabla forebay did elicit concern during much of the summer.

Accordingly, during 2007, coliform samples were taken at five locations in DeSabla forebay on a single date (August 7, 2007). The spatially averaged geometric mean of these samples was 166 CFU/100mL. Nonetheless, the summer 2007 fecal coliform results indicate that fecal coliform levels may be of concern periodically at certain locations in the DeSabla forebay.

*Chemical Constituents*

PG&E sampled 25 chemical constituents during spring, summer, and fall 2006, and summer 2007.[35] The Basin Plan requires that water designated for use as domestic or

[35] More specific details about sampling sites, frequency, and parameters measured are discussed in PG&E's Updated Study Results and License Application Sections filed on December 31, 2007 (PG&E, 2007a and b).

municipal supply shall not contain concentrations of chemical constituents in excess of the Maximum Contaminant Levels specified in the provisions of Title 22 of the California Code of Regulations. Low levels of inorganic and trace metal constituents occurred throughout the study area with no exceedances of the Basin Plan criteria, demonstrating generally high water quality typical of snow-melt fed river systems of the Sierra Nevada.

*Tastes and Odor*

The Basin Plan requires that waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses. PG&E monitored 12 substances during water quality studies with only sodium found in excess of the applicable criterion (30 to 60 mg/L) at one station in the West Branch Feather River above Hendricks diversion dam during spring sampling at a concentration of 81 mg/L.[12]

*Total and Methyl Mercury*

One site on Butte Creek downstream of Centerville powerhouse was sampled for total mercury in 2006 and 2007, and two sites on the West Branch Feather River (one in Philbrook reservoir and one upstream of the Hendricks diversion) were sampled for total and methyl mercury in 2006 and 2007. In Butte Creek total mercury ranged from 0.33 to 0.85 ng/L and in West Branch Feather River total mercury ranged from 0.28 to 0.88 ng/L. Methyl mercury in West Branch Feather River ranged from 0.011 to 0.056 ng/L. All samples were well below acceptable Basin Plan criteria.

Fish tissue total mercury samples, measured in both whole body and filet samples, were collected from Philbrook reservoir and DeSabla forebay during August 2006. Fish were collected from multiple locations in each reservoir over 2 to 3 days, with twenty individuals of varying lengths included for analysis. Measured values for total mercury in filet samples ranged 24.1 to 27.0 ng/g for individual rainbow trout and 25.0 to 49.3 ng/g for composite samples of rainbow and brown trout. Measured values in whole body samples were generally lower, ranging from 22.8 to 29.6 ng/g for individual rainbow trout and 25.8 to 35.4 ng/g for composite samples of rainbow and brown trout. All samples were well below the National Recommended Water Quality Criteria for Human Health Consumption for Organism Only at 0.3 mg/kg (300 ng/g) (EPA, 2001).

*Hydrocarbons*

Water samples for hydrocarbons analysis were collected in Philbrook reservoir and DeSabla forebay during the Independence and Labor Day weekend sampling events. The Basin Plan requires that water not contain hydrocarbons, oils, greases, waxes or other material in concentrations that cause nuisance, result in visible film or coating on the

surface of the water or on objects in the water, or otherwise adversely affect beneficial uses. No exceedances of the Basin Plan criteria were identified.

**Fisheries**

The DeSabla-Centerville Hydroelectric Project is located on both Butte Creek and the West Branch Feather River. Fourteen tributaries (eight to Butte Creek and six to the West Branch Feather River) are located in the project. Twelve of the fourteen tributaries have feeder diversions that provide flows directly to project canals. Table 3-16 lists each of these tributaries by drainage basin; identifies whether or not they have a feeder diversion; and, if so, which project canals flows are diverted to (see figures 1-2 and 1-3 for project facilities and drainage basins).

Table 3-16. Tributaries to Butte Creek and the West Branch Feather River affected by the DeSabla-Centerville Hydroelectric Project from upstream to downstream by drainage basin. (Source: Staff, 2009)

| Tributary | Feeder Diversion | Canal Diverted to |
|---|---|---|
| **Butte Creek** | | |
| Inskip Creek | Yes | Butte |
| Kelsey Creek | Yes | Butte |
| Stevens Creek[a] | Yes | Butte |
| Clear Creek | Yes | Butte |
| Little Butte Creek[a] | Yes | Toadtown |
| Oro Fino Ravine[a] | Yes | Lower Centerville |
| Emma Ravine[a] | Yes | Lower Centerville |
| Coal Claim[a] | Yes | Lower Centerville |
| Helltown Ravine | Yes | Lower Centerville |
| **West Branch Feather River** | | |
| Coon Hollow Creek | No | N/A |
| Philbrook Creek | No | N/A |
| Little West Fork | Yes | Hendricks |
| Cunningham Ravine | Yes | Hendricks |
| Long Ravine | Yes | Hendricks |

[a] Diversions from these tributaries have been discontinued.

*Butte Creek and Butte Creek Tributaries*

Within the project area, Butte Creek supports two distinct fish assemblages. The upper reach of Butte Creek, from Butte Creek diversion dam to the Lower Centerville diversion dam (upper Butte Creek) supports resident "trout assemblage," consisting primarily of resident rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). The lower reach of Butte Creek between Lower Centerville diversion dam and the downstream Parrott-Phelan diversion dam,[36] (lower Butte Creek), supports both anadromous and resident fish communities. The lower reach of Butte Creek, supports the "pikeminnow-hardhead-sucker assemblage," and includes a large self-sustaining population of the federally and state-listed Central Valley spring-run Chinook salmon (*O. tshawytscha*), as well as a population of the federally listed Central Valley steelhead (*O. mykiss*). Restoration efforts in lower Butte Creek, initiated in the 1990s under the Central Valley Project Improvement Act, have resulted in large numbers of adult spring-run Chinook salmon returning to lower Butte Creek in recent years. Cool water diverted by the project from the West Branch Feather River provides approximately 40 percent of the entire flow in lower Butte Creek during the summer months of July through September.

The upper reach of Butte Creek is confined in a steep rocky canyon with substrates primarily of boulder, cobble and bedrock, and smaller amounts of gravel. The upper reach comprises mostly plunge/step pool and cascade habitats and contains several large waterfalls. Sixteen natural barriers were mapped in a 3.5 mile reach upstream of the Lower Centerville diversion dam. In particular, in the first mile upstream of the Lower Centerville diversion dam, six waterfalls 10 feet or greater in height occur; the largest waterfall is 35 feet high and located 0.58 mile upstream of the Lower Centerville diversion dam.

The Butte Creek stream gradient between Lower Centerville diversion dam and Parrott-Phelan diversion dam is approximately 1.2 percent. The lower Butte Creek is a transition zone between the upper Butte type of high gradient riffles, falls, and plunge pools to a lower gradient depositional reach near Honey Run Covered Bridge. About 2 miles of stream below Lower Centerville diversion dam are characterized by deep pools, large boulders, and a narrow rocky canyon. The Quartz Bowl pool and barrier is located within this section, approximately 1 mile downstream of Lower Centerville diversion dam, and forms the typical upper limit of spring-run Chinook salmon migration. The stream section below the barrier provides some of the better summer holding habitat for spring-run Chinook salmon and has a good pool-to-riffle ratio, small boulders, and more gravel. The lowermost section is wider and shallower, and is characterized by slower water velocities. From Centerville powerhouse to the Honey Run Covered Bridge, the stream channel further widens and more sediment is stored in the channel and banks.

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[36] The Parrot-Phelan diversion dam is not a project facility.

Discharge increases in this reach from return flow at the Centerville powerhouse and near the lower end of the reach, and with flow from Little Butte Creek.

In Butte Creek, fish species composition was exclusively trout in the upper watershed, changing to transitional zone species (e.g., hardhead and Sacramento pikeminnow), and anadromous species (Chinook salmon and steelhead [*O. mykiss*]) below the Lower Centerville diversion dam. The anadromous fish range within the project area was identified as from Butte Creek up to the Lower Centerville diversion dam (PG&E, 2004). For the purpose of the relicensing studies, *O. mykiss* observations downstream of the Lower Centerville diversion dam were reported as steelhead/rainbow trout because differentiation between steelhead and rainbow trout was not possible during snorkel surveys. Table 3-17 identifies current and previously reported fish species known to occur in the project's study area. Table 3-18 documents the fish observed during September-October 2006 stream surveys in the DeSabla-Centerville Hydroelectric Project study area.

Figures 3-20 through 3-23, demonstrate the length frequency distribution of fish observed in the vicinity of the Butte Creek and Lower Centerville diversion dams in 2007; while figure 3-24 provides a historical comparison of trout abundance within Butte Creek upstream and downstream of the Butte Creek diversion dam.

Table 3-17. Fish species documented in the DeSabla-Centerville Hydroelectric Project study area. (Source: PG&E, 2007, as modified by staff).[1]

| Stream Reaches and river miles | Butte Creek | | | | Butte Creek Tributaries | | | | West Branch Feather River Tributaries | | | | | Reservoirs | | | References |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Upstream of Butte Div. Dam (72.2) [2] | Butte Creek Div. Dam to Lower Centerville Div. Dam(71.8, 65.3, 61.9) | Lower Centerville Div. Dam to Centerville powerhouse (61.7, 60.8, 59.0, 56.5) | Centerville PH to Parrott-Phelan Div. Dam (54.6, 53.4, 50.5) | Inskip Creek [2,4] | Kelsey Creek [2,4] | Clear Creek, [4] | West Branch Feather River (43.6, 41.1, 35.0, 30.2, 28.5, 23.3, 16.0) | Coon Hollow Creek[2] | Philbrook Creek[5] | Long Ravine [2,4] | Cunningham Ravine [2,4] | Little West Fork, [4] | DeSabla Forebay | Round Valley reservoir [3] | Philbrook Reservoir | |
| **Petromyzontidae (Lamprey family)** | | | | | | | | | | | | | | | | | |
| Pacific lamprey | | | ● | ● | | | | | | | | | | | | | PG&E, 2004 |
| **Salmonidae (Salmon and trout family)** | | | | | | | | | | | | | | | | | |
| Chinook salmon (spring run) | | | ● ○ | ● ○ | | | | | | | | | | | | | PG&E, 2004 |
| Chinook salmon (fall run) | | | | ● | | | | | | | | | | | | | PG&E, 2004 |
| Steelhead / rainbow | | | ● ○ | ● ○ | | | | | | | | | | | | | PG&E, 2004 |
| Rainbow trout | ○ | ● ○ | ● | ● | ○ | ○ | ●○ | ● ○ | ○ | ● ○ | ○ | ○ | ● ○ | ●○ | ● | ● ○ | PG&E, 2004 |
| Rainbow hybrid / color morph | | ○ | | | | | | ○ | ○ | ○ | | | | | | | |

| Stream Reaches and river miles | Butte Creek | | | | Butte Creek Tributaries | | | West Branch Feather River Tributaries | | | | | | Reservoirs | | | References |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Upstream of Butte Div. Dam (72.2) [2] | Butte Creek Div. Dam to Lower Centerville Div. Dam(71.8, 65.3, 61.9) | Lower Centerville Div. Dam to Centerville powerhouse (61.7, 60.8, 59.0, 56.5) | Centerville PH to Parrott-Phelan Div. Dam (54.6, 53.4, 50.5) | Inskip Creek [2, 4] | Kelsey Creek [2, 4] | Clear Creek, [4] | West Branch Feather River (43.6, 41.1, 35.0, 30.2, 28.5, 23.3, 16.0) | Coon Hollow Creek[2] | Philbrook Creek[5] | Long Ravine [2, 4] | Cunningham Ravine [2, 4] | Little West Fork, [4] | DeSabla Forebay | Round Valley reservoir [3] | Philbrook Reservoir | |
| Brown trout | ○ | ● ○ | ● | ● | | | ●○ | ● ○ | ○ | ● ○ | ○ | ○ | ● ○ | ●○ | ● | ● ○ | PG&E, 2004 |
| Brook trout | | | | | | | | ○ | ○ | | | | | | | | |
| **Cyprinidae (Minnow family)** | | | | | | | | | | | | | | | | | |
| California roach | | | ● ○ | ● ○ | | | | | | | | | | | | | PG&E, 2004 |
| Golden shiner | | | | | | | | | | | | | | ○ | | | |
| Hardhead | | | ● ○ | ● ○ | | | | | | | | | | | | | PG&E, 2004 |
| Sacramento pikeminnow | | | ● ○ | ● ○ | | | | | | | | | | | | | PG&E, 2004 |
| Pikeminnow/ hardhead | | | ○ | ○ | | | | | | | | | | | | | |
| Cyprinid species | | | ○ | ○ | | | | ○ | | | | | | | | | |

| Stream Reaches and river miles | Butte Creek | | | | Butte Creek Tributaries | | | | West Branch Feather River Tributaries | | | | | Reservoirs | | | References |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Upstream of Butte Div. Dam (72.2) [2] | Butte Creek Div. Dam to Lower Centerville Div. Dam(71.8, 65.3, 61.9) | Lower Centerville Div. Dam to Centerville powerhouse (61.7, 60.8, 59.0, 56.5) | Centerville PH to Parrott-Phelan Div. Dam (54.6, 53.4, 50.5) | Inskip Creek [2, 4] | Kelsey Creek [2, 4] | Clear Creek, [4] | West Branch Feather River (43.6, 41.1, 35.0, 30.2, 28.5, 23.3, 16.0) | Coon Hollow Creek[2] | Philbrook Creek[5] | Long Ravine [2, 4] | Cunningham Ravine [2, 4] | Little West Fork, [4] | DeSabla Forebay | Round Valley reservoir [3] | Philbrook Reservoir | |
| **Catostomidae (Sucker family)** | | | | | | | | | | | | | | | | | |
| Sacramento sucker | | | ● ○ | ● ○ | | | | ○ | | | | | | | | | PG&E, 2004 |
| **Cottidae (Sculpin family)** | | | | | | | | | | | | | | | | | |
| Riffle sculpin | | ● | ● | ● | | | | | | | | | | | | | PG&E, 2004 |
| Cottus species | | | ○ | ○ | | | | | | | | | | | | | |
| **Embiotocidae (Surfperch family)** | | | | | | | | | | | | | | | | | |
| Tule perch | | | ● | ● ○ | | | | | | | | | | | | | PG&E, 2004 |

1 ○ denotes species documented during 2006 surveys; ● denotes species documented historically (before 2004).

2 No historic data available.

3 Not sampled in 2006.

4 Includes stream area upstream and downstream of feeder diversion.

Table 3-18. Number of fish observed during September-October 2006 stream surveys in the DeSabla-Centerville Hydroelectric Project study area. (Source: PG&E, 2007, as modified by staff)

| Site Name | Site Description | Survey Method | Number Observed | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brook trout | Brown trout | Chinook salmon | Rainbow trout | Rainbow hybrid / color morph | Steelhead / rainbow | Sacramento sucker | Cottus species | Cyprinid species | Hardhead | Sacramento pikeminnow | Pikeminnow / hardhead | California roach | Tule perch | Golden Shiner | Total Number Observed |
| **BUTTE CREEK** | | | | | | | | | | | | | | | | | | |
| Butte 72.2 | Upstream of Butte Creek diversion dam | Snorkel | | 2 | | 11 | | | | | | | | | | | | 13 |
| Butte 71.8 | Downstream of Butte Creek Div. Dam | Snorkel | | | | 1 | | | | | | | | | | | | 1 |
| Butte 65.3 | | E-fish | | 1 | | 94 | 1 | | | | | | | | | | | 96 |
| Butte 61.9 | Downstream of DeSabla powerhouse | Snorkel | | | | 57 | | | | | | | | | | | | 57 |
| Butte 61.7 | Downstream of Lower Centerville Div. | Snorkel | | | | | | 238 | | | | | | | | | | 238 |
| Butte 60.8 | | Snorkel | | | | | | 263 | | 1 | | | | | | | | 264 |
| Butte 59.0 | | Snorkel | | | | | | 142 | 242 | 9 | 435 | | 22 | | 1 | | | 851 |
| Butte 56.5 | | Snorkel | | | 90 | | | 74 | 2,735 | 8 | | 29 | 166 | 3,586 | 199 | | | 6,887 |

| Site Name | Site Description | Survey Method | Number Observed | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brook trout | Brown trout | Chinook salmon | Rainbow trout | Rainbow hybrid / color morph | Steelhead / rainbow | Sacramento sucker | Cottus species | Cyprinid species | Hardhead | Sacramento pikeminnow | Pikeminnow / hardhead | California roach | Tule perch | Golden Shiner | Total Number Observed |
| Butte 54.6 | Downstream of Centerville powerhouse | Snorkel | | | 107 | | | 68 | 102 | 7 | 32 | 21 | 17 | 16 | 31 | | | 401 |
| Butte 53.4 | | Snorkel | | | 72 | | | 58 | 164 | 1 | | 20 | 59 | 227 | 23 | | | 624 |
| Butte 50.5 | | Snorkel | | | 4 | | | 33 | 911 | 1 | 280 | 22 | 789 | | 800 | 2 | | 2,842 |
| **BUTTE CREEK TRIBUTARIES** | | | | | | | | | | | | | | | | | | |
| Inskip-F1 | Inskip Creek - upstream of diversion | E-fish | | | | 14 | | | | | | | | | | | | 14 |
| Inskip-F2 | Inskip Creek - downstream of diversion | E-fish | | | | 42 | | | | | | | | | | | | 42 |
| Kelsey-F1 | Kelsey Creek - upstream of diversion | E-fish | | | | 22 | | | | | | | | | | | | 22 |
| Kelsey-F2 | Kelsey Creek - downstream of diversion | E-fish | | | | 20 | | | | | | | | | | | | 20 |
| Clear-F1 | Clear Creek - upstream of diversion | E-fish | | 13 | | 30 | | | | | | | | | | | | 43 |
| Clear-F2 | Clear Creek - downstream of diversion | E-fish | | | | 11 | | | | | | | | | | | | 11 |

| Site Name | Site Description | Survey Method | Number Observed | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brook trout | Brown trout | Chinook salmon | Rainbow trout | Rainbow hybrid / color morph | Steelhead / rainbow | Sacramento sucker | Cottus species | Cyprinid species | Hardhead | Sacramento pikeminnow | Pikeminnow / hardhead | California roach | Tule perch | Golden Shiner | Total Number Observed |
| **WEST BRANCH FEATHER RIVER** | | | | | | | | | | | | | | | | | | |
| West Branch Feather River 43.6 | Downstream of Round Valley reservoir | E-fish | 2 | | | 5 | | | | | | | | | | | | 7 |
| West Branch Feather River 41.1 | Downstream of Coon Hollow Creek | E-fish | | 25 | | 45 | 2 | | | | | | | | | | | 72 |
| West Branch Feather River 35.0 | Downstream of Philbrook Creek | E-fish | | 5 | | 65 | | | | | | | | | | | | 70 |
| West Branch Feather River 30.2 | | Snorkel | | 1 | | 3 | | | | | | | | | | | | 4 |
| West Branch Feather River 28.5 | Downstream of Hendricks diversion dam | E-fish | | 3 | | 105 | | | | | | | | | | | | 108 |
| West Branch Feather River 23.3 | | Snorkel | | 1 | | 34 | | | | | | | | | | | | 35 |

| Site Name | Site Description | Survey Method | Number Observed | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brook trout | Brown trout | Chinook salmon | Rainbow trout | Rainbow hybrid / color morph | Steelhead / rainbow | Sacramento sucker | Cottus species | Cyprinid species | Hardhead | Sacramento pikeminnow | Pikeminnow / hardhead | California roach | Tule perch | Golden Shiner | Total Number Observed |
| West Branch Feather River 16.0 | | Snorkel | | 4 | | 76 | | | 32 | | 1,212 | | | | | | | 1,324 |
| **WEST BRANCH FEATHER RIVER TRIBUTARIES** | | | | | | | | | | | | | | | | | | |
| Coon-F1 | Coon Hollow Creek upstream of West Branch Feather River | E-fish | 17 | 4 | | 160 | 29 | | | | | | | | | | | 210 |
| Philbrook-F1 | Philbrook Creek - upstream of reservoir | E-fish | | 599 | | | | | | | | | | | | | | 599 |
| Philbrook-F2 | Philbrook Creek - downstream of reservoir | E-fish | | 5 | | 41 | 3 | | | | | | | | | | | 49 |
| Long-F1 | Long Ravine - upstream of diversion | E-fish | | 2 | | 29 | | | | | | | | | | | | 31 |
| Long-F2 | Long Ravine - downstream of diversion | E-fish | | 28 | | 42 | | | | | | | | | | | | 70 |
| Cunningham-F1 | Cunningham Ravine - upstream of div. | E-fish | | | | 45 | | | | | | | | | | | | 45 |
| Cunningham-F2 | Cunningham Ravine - downstream of div. | E-fish | | 37 | | | | | | | | | | | | | | 37 |

| Site Name | Site Description | Survey Method | Number Observed | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brook trout | Brown trout | Chinook salmon | Rainbow trout | Rainbow hybrid / color morph | Steelhead / rainbow | Sacramento sucker | Cottus species | Cyprinid species | Hardhead | Sacramento pikeminnow | Pikeminnow / hardhead | California roach | Tule perch | Golden Shiner | Total Number Observed |
| Little West Fork-F1 | Little West Fork - upstream of diversion | E-fish | | | | 23 | | | | | | | | | | | | 23 |
| Little West Fork-F2 | Little West Fork - downstream of Div. | E-fish | | 28 | | 1 | | | | | | | | | | | | 29 |
| **PHILBROOK RESERVOIR** | | | | | | | | | | | | | | | | | | |
| G1 | Western edge, near southwest shoreline | Gill net | | 3 | | 48 | | | | | | | | | | | | 51 |
| G2 | Western edge, near northwest shoreline | Gill net | | | | 8 | | | | | | | | | | | | 8 |
| G3 | Northwest edge of reservoir | Gill net | | 3 | | 13 | | | | | | | | | | | | 16 |
| S1 | Southern edge of reservoir at small island | Seine | | | | | | | | | | | | | | | | 0 |
| S2 | Eastern edge of reservoir near stream channel | Seine | | | | | | | | | | | | | | | | 0 |
| S3 | West bank of reservoir | Seine | | | | 3 | | | | | | | | | | | | 3 |
| S4 | West end of reservoir near spillway | Seine | | | | | | | | | | | | | | | | 0 |

| Site Name | Site Description | Survey Method | Number Observed | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brook trout | Brown trout | Chinook salmon | Rainbow trout | Rainbow hybrid / color morph | Steelhead / rainbow | Sacramento sucker | Cottus species | Cyprinid species | Hardhead | Sacramento pikeminnow | Pikeminnow / hardhead | California roach | Tule perch | Golden Shiner | Total Number Observed |
| **DESABLA FOREBAY** | | | | | | | | | | | | | | | | | | |
| G1 | Near western shore | Gill net | | 5 | | 5 | | | | | | | | | | | | 10 |
| G2 | Shallow southwest shore | Gill net | | 6 | | 3 | | | | | | | | | | | | 9 |
| E1 | Western shore | E-fish | | | | 1 | | | | | | | | | | | | 1 |
| E2 | Northwest shore | E-fish | | | | | | | | | | | | | | | 16 | 16 |
| E3 | Northern edge near shoreline | E-fish | | | | | | | | | | | | | | | 0 | |
| E4 | Southwest shoreline near dam | E-fish | | 1 | | 2 | | | | | | | | | | | | 3 |

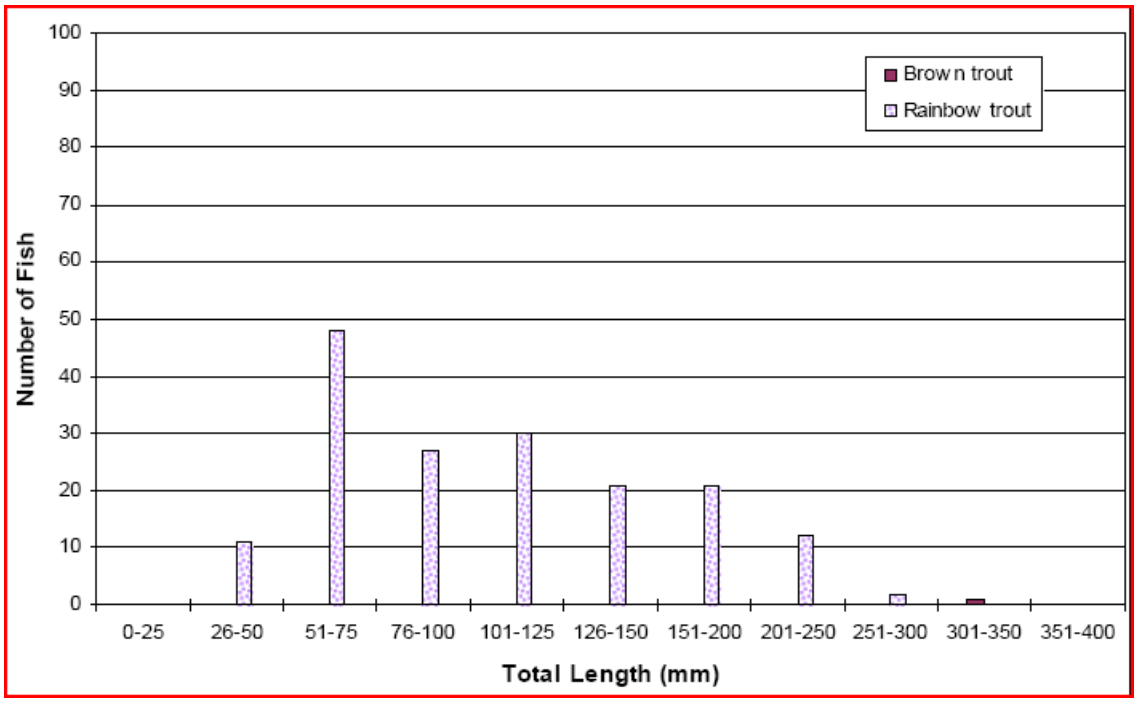


Figure 3-20. Length frequency distribution of fish observed during snorkel surveys in Butte Creek upstream of Butte Creek diversion dam in 2007. (Source: PG&E, 2007 as modified by staff)

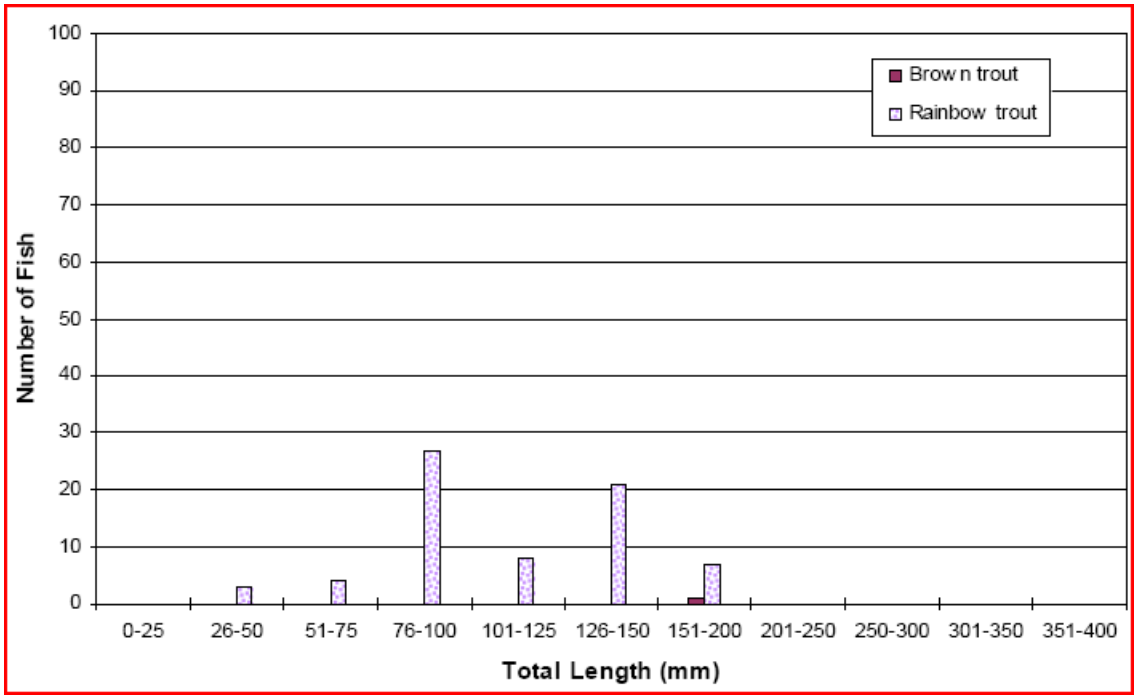


Figure 3-21. Length frequency distribution of fish observed during snorkel surveys in Butte Creek downstream of Butte Creek diversion dam in 2007. (Source: PG&E, 2007 as modified by staff).

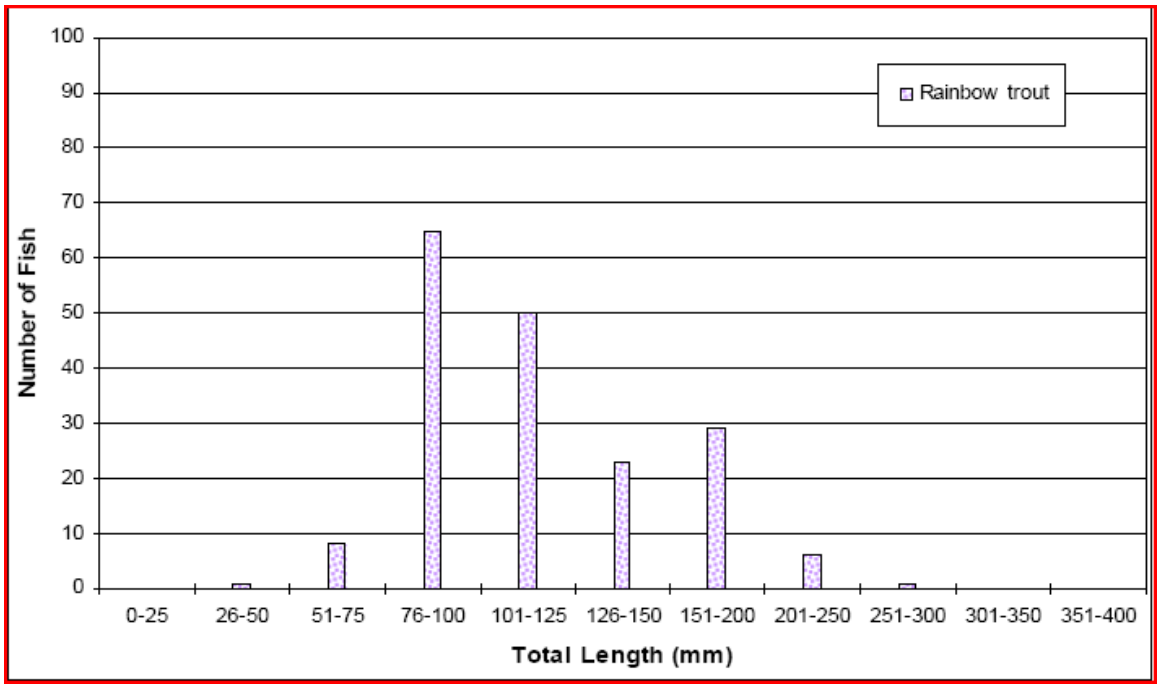


Figure 3-22. Length frequency distribution of fish observed during snorkel surveys in Butte Creek upstream of Lower Centerville diversion dam in 2007. (Source: PG&E, 2007 as modified by staff)

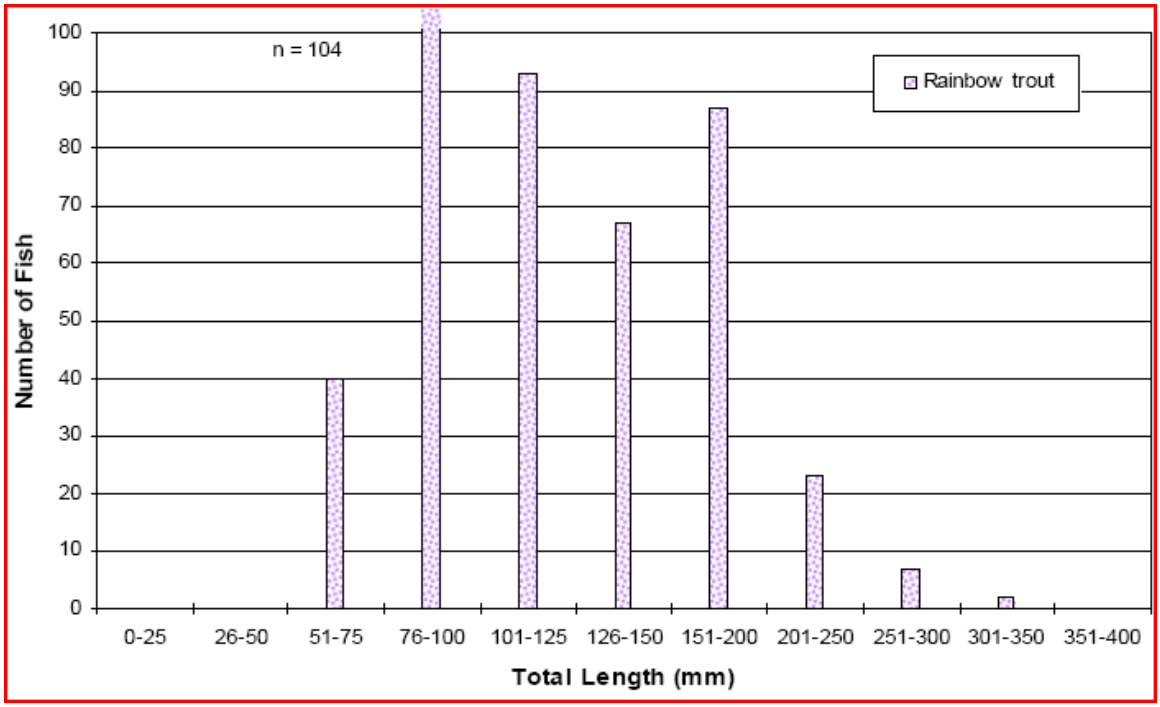


Figure 3-23. Length frequency distribution of fish observed during snorkel surveys in Butte Creek downstream of Lower Centerville diversion dam in 2007. (Source: PG&E, 2007, as modified by staff)

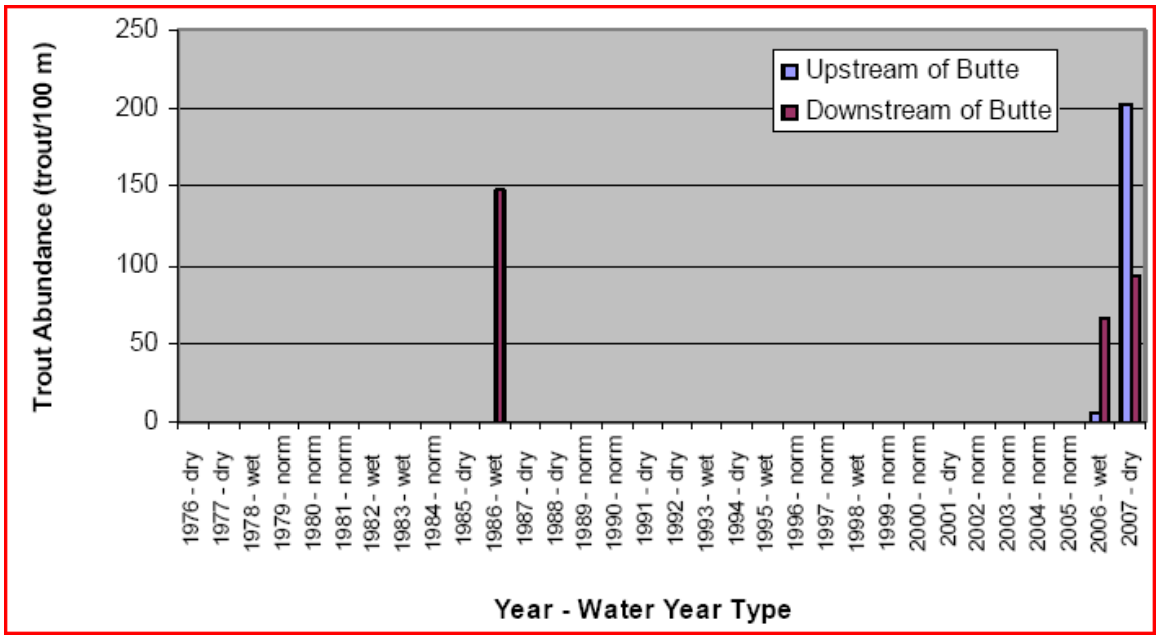


Figure 3-24. Historical comparison of trout abundance within Butte Creek upstream and downstream of the Butte Creek diversion dam. (Source: PG&E, 2007 as modified by staff)

*West Branch Feather River*

The West Branch Feather River within the project area extends from Round Valley reservoir downstream to the non-project Miocene diversion. The primary fish assemblage on the West Branch Feather River is the "trout assemblage," consisting primarily of rainbow and brown trout. The West Branch Feather River can be divided into two subreaches: the upper West Branch Feather River from Round Valley reservoir to Hendricks diversion dam, and the lower West Branch Feather River from Hendricks diversion dam to the Miocene diversion (see figure 1-2).

In the lower reaches of the West Branch Feather River, stream habitat contained larger run and pool habitat in the lower sections of the Study Area compared to the upper reaches; however, unlike Butte Creek, the upper reaches of the West Branch Feather River were not confined in steep canyons and the stream habitat contained fewer boulders. The upper West Branch Feather River varies considerably between Round Valley reservoir and the downstream Hendricks diversion dam. The channel downstream of Round Valley reservoir is narrow with a higher percentage of canopy cover. In addition, flow between Round Valley reservoir and Coon Hollow Creek is intermittent with no surface flow by summertime. Channel conditions between Coon Hollow Creek and just below Philbrook Creek are similar; however, the flow source below Philbrook Creek alternates between releases from Round Valley reservoir in the spring, to releases from Philbrook reservoir through the summer and fall months. Below Hendricks diversion dam, downstream to the Miocene diversion, the habitat in the West Branch

Feather River is characterized as good trout habitat. Two major tributaries, Big Kimshew Creek and Cold Creek, join with the West Branch Feather River below Hendricks diversion dam.

The fishery between Round Valley reservoir and Philbrook Creek is described as "marginal," but improves below Philbrook Creek in response to increased flow and improved trout habitat. Brown trout and rainbow trout are common in the West Branch Feather River below Philbrook Creek. Habitat is dominated by long riffle/runs and large pools. The substrate is primarily small boulders and rubble, with some spawning gravels.

In the upper watershed of the West Branch Feather River, fish species composition was exclusively trout but changed to transitional zone species (e.g., hardhead and Sacramento pikeminnow) at the lowermost survey site. The species composition at all West Branch Feather River survey locations is depicted in table 3-18. As observed during the relicensing studies, fish species composition in the tributaries to the West Branch Feather River was exclusively trout. Brook, brown, rainbow, and hybrid trout were the species observed as identified in table 3-17.

Figures 3-25 and 3-26 show length frequency distribution of fish observed in the vicinity of the Hendricks diversion dam and on the West Branch Feather River in 2007; while figure 3-27 provides a historical comparison of trout abundance within the West Branch Feather River upstream and downstream of the Hendricks diversion dam.

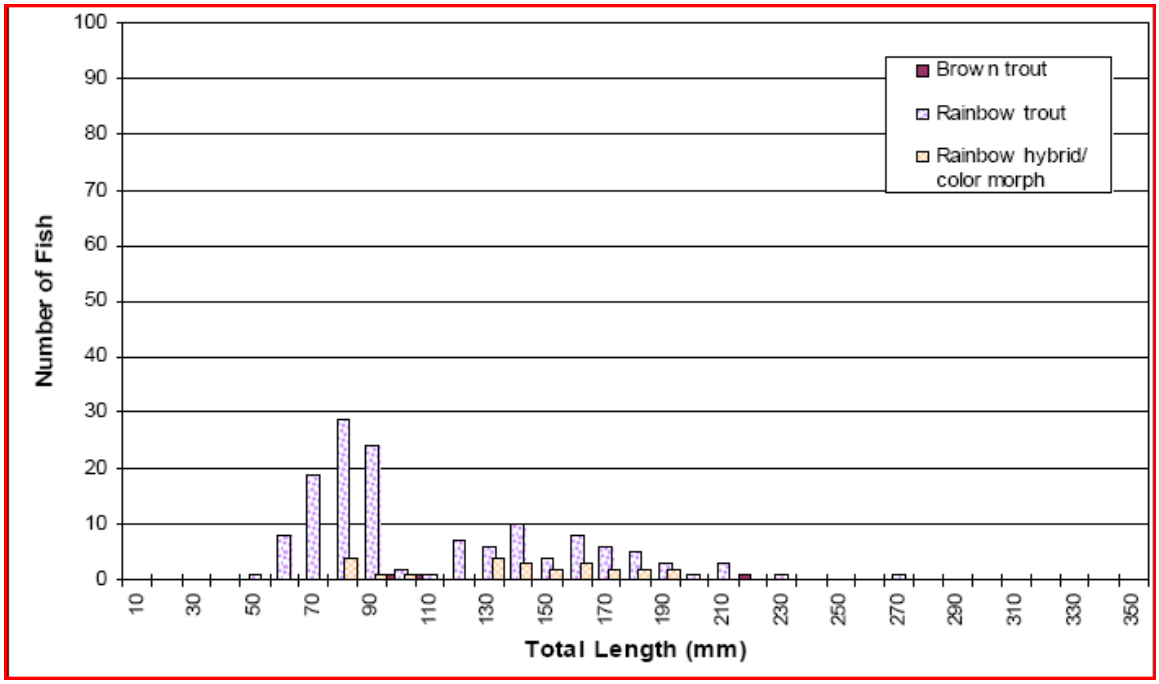


Figure 3-25. Length frequency distribution of fish observed during electrofishing the West branch Feather River Upstream of Hendricks diversion dam, during 2007 surveys. (Source: PG&E, 2007 as modified by staff)

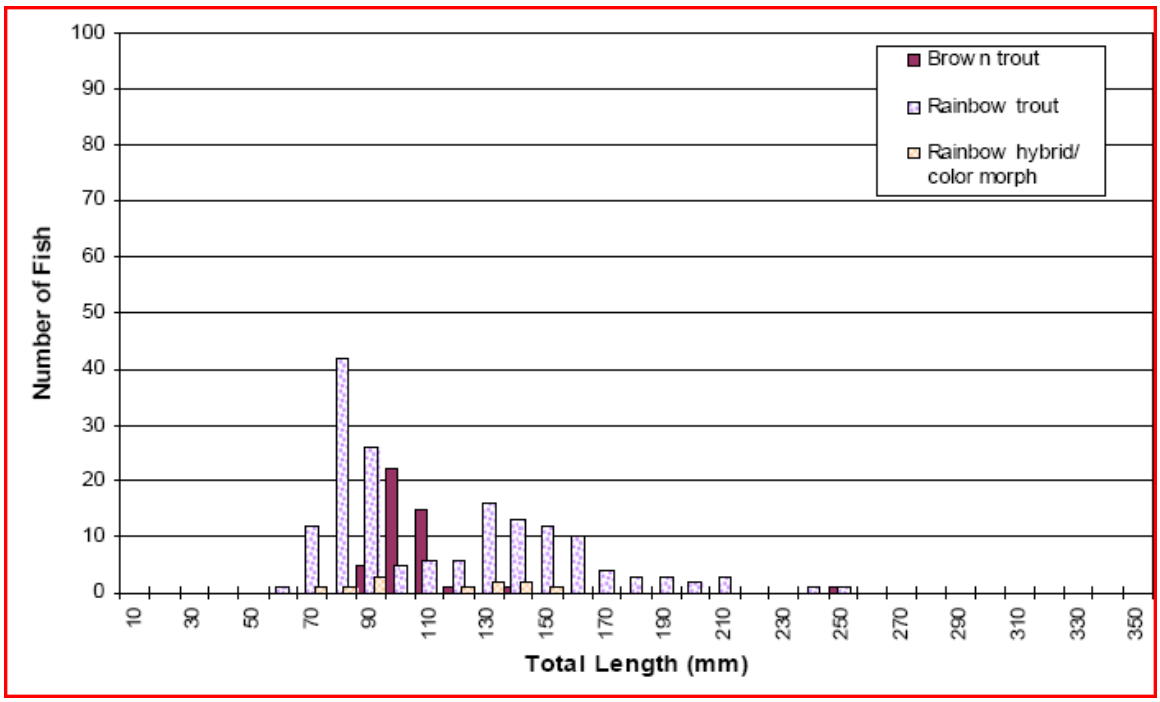


Figure 3-26. Length frequency distribution of fish observed during electrofishing the West branch Feather River downstream of Hendricks diversion dam, during 2007 surveys. (Source: PG&E, 2007 as modified by staff)

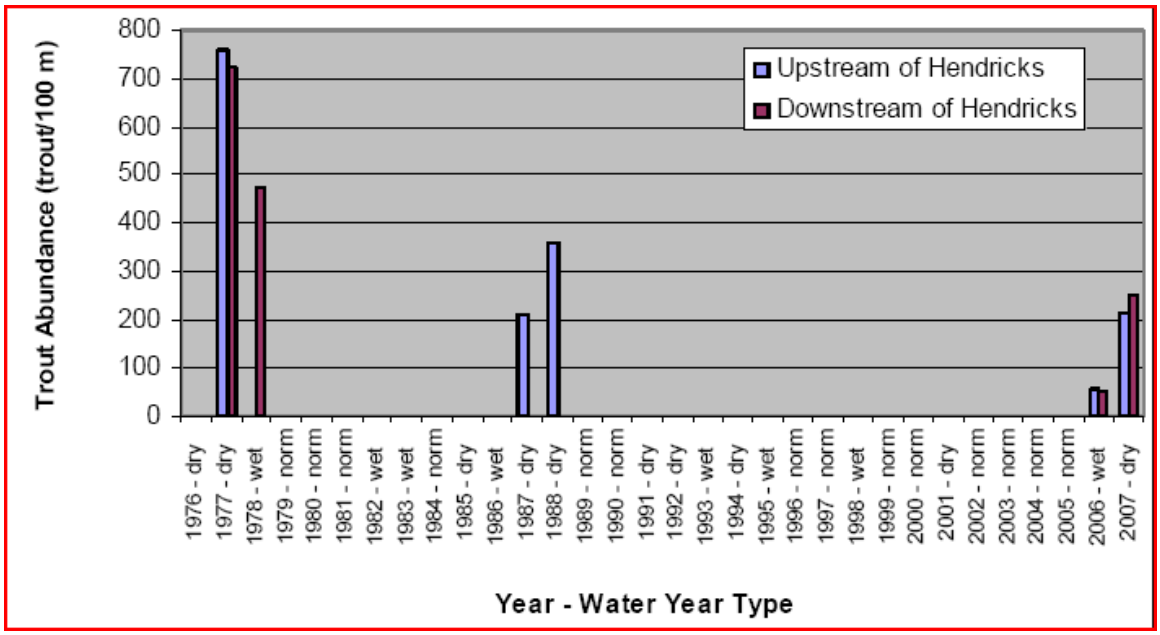


Figure 3-27. Historical comparison of trout abundance within the West Branch Feather River upstream and downstream of the Hendricks diversion dam. (Source: PG&E, 2007, as modified by staff)

*Project Reservoirs*

Rainbow trout and brown trout are the primary fish species in Philbrook reservoir and DeSabla forebay. Cal Fish & Game maintains the trout populations in Philbrook reservoir through an annual stocking program. It also maintains a put-and-take fishery in DeSabla forebay with biweekly plants of catchable rainbow trout during the spring and summer months. The forebay maintains a population of brown trout, with many fish weighing more than 1 pound. Due to the annual draining of Round Valley reservoir, no fish are stocked and fish populations are assumed to be minimal.

Reservoir sampling was conducted in Philbrook reservoir and DeSabla forebay in August through September 2006 using gillnetting, beach seine, and/or boat electrofishing methods. Fish species observed included rainbow trout and brown trout in both study impoundments as well as golden shiner within DeSabla forebay. Both juvenile and adult lifestages of trout were present in Philbrook reservoir whereas, only adult trout were observed in DeSabla forebay.

*Project Canals and Feeder Diversions and Tributaries*

Fish are entrained into the project canals at the project's diversion dams. The project's active canals are Butte, Hendricks/Toadtown, and Lower Centerville. PG&E has routinely conducted cooperative fish rescues for fish entrained into the canals, with Cal Fish & Game in the Butte, Lower Centerville, Hendricks and Toadtown canals when the canals are dewatered for annual maintenance. Rainbow trout and brown trout are the only fish species that have been observed during these fish rescues.

Butte canal is supplemented by feeder diversions on three tributary streams to upper Butte, Inskip, Kelsey, and Clear creeks, (see table 3-16). These diversions are located at approximately 3,000 feet in elevation and located 0.5, 2 and 3.7 miles downstream, respectively of the Butte Creek diversion dam. These feeder tributaries are small high gradient perennial streams that exhibit flashy flows during portions of the winter season. Only rainbow trout have been observed both upstream and downstream of each of the feeder diversions on Inskip and Kelsey creeks. In Clear Creek, both brown and rainbow trout have been observed above and below its feeder diversion (table 3-17).

The channel gradient in the West Branch Feather River feeder tributaries is not as steep as in Butte Creek tributaries. As a result, the stream habitat within the West Branch Feather River feeder tributaries generally contains more riffle habitat with smaller particle-size substrates (including gravels and cobble).

In addition to the feeder tributaries surveyed, fish surveys were also conducted on Coon Hollow and Philbrook creeks. The stream habitat in Coon Hollow Creek was similar to the stream conditions in the West Branch Feather River downstream of Coon Hollow Creek. The stream habitat in Philbrook Creek varied considerably between sites

above the reservoir and below the reservoir. Philbrook Creek is intermittent above the reservoir with broad meandering channels composed of gravel and cobble, whereas the channel downstream of Philbrook reservoir is more confined with larger substrates (boulder and bedrock).

*Fish Entrainment at Project Diversion Dams*

Rainbow trout and brown trout, which occur in both the West Branch Feather River and Butte Creek watersheds, are present in the diversion canals, and are assumed to enter the canals via the mainstem and tributary diversions from each stream. Fish can move back and forth between the canal and the stream at each mainstem diversion point and fish can move upstream and downstream within sections of each canal; however, once a fish leaves the lower end of a canal, it is assumed that it cannot move back in (a drop structure and grizzly structure may serve as a partial barrier or deterrent). At the feeder tributary diversions, fish that pass into the canals are assumed to be unable to return to their natal streams, because of an approximately 1-meter outfall from diversion pipes to the canal. There is probably some loss of canal immigrants by predation from other fishes in the canals, and conversely, there is evidence of limited production via spawning of canal "residents" also.

Historically, when PG&E planned to dewater a canal for a scheduled outage, it coordinated with Cal Fish & Game to rescue fish from the canal as it was dewatered. Fish rescue efforts typically required electroshocking fish in the canal as the water surface declined, placing the fish in a fish hatchery holding truck, and then introducing the fish into a nearby stream chosen by Cal Fish & Game. During some of these fish rescue efforts, PG&E counted and recorded fish species and lifestages by quick visual observation as the fish were moved from the canal to the holding truck. Records of some of these fish rescue efforts are available between the 1990s, 2002, and 2005 (table 3-19).

*Relicensing Preparation Data (2005)*

As part of its licensing studies, PG&E weighed and measured each captured fish and noted its general capture location from the Butte and Hendricks/Toadtown canals during the spring 2005 and 2007, scheduled canal outages.

Butte canal was taken out of service in late April 2005, and fish rescue occurred on April 25 and 26, 2005. PG&E collected 986 trout in eight segments. Roughly two-thirds (69 percent of the trout collected) were rainbow trout, with the balance being brown trout. Most of the fish (45 percent of the trout collected) were found in the segment from Butte Canal Siphon to Pete Woods Mine Road (table 3-20). Both the rainbow and brown trout were in good condition with average K condition factors of 1.17 for rainbow trout (n=681) and 1.14 for brown trout (n=305). The length-frequency distribution for rainbow trout in Butte canal indicates that all age classes were present (figure 3-28).

Table 3-19. Summary of PG&E's fish rescue efforts between 1989 and 2005. Counts were sometimes categorized by life stage. (Source: PG&E 2007, as modified by staff)*

| Date | Month | Life Stage | Trout Species | | Total |
|---|---|---|---|---|---|
| | | | Rainbow | Brown | |
| **BUTTE CANAL** | | | | | |
| 1989 | June | **All** | **954** | **408** | **1,362** |
| 1991 | ----- | **All** | **723** | **311** | **1,034** |
| 1992 | September | **All** | **1,200** | **1,530** | **2,730** |
| 1995 | October | **All** | **422** | **1,360** | **1,782** |
| | | *YOY* | *225* | *1,027* | *1,252* |
| | | *Other* | *197* | *333* | *530* |
| **HENDRICKS/TOADTOWN CANAL** | | | | | |
| 1990 | September | **All** | **550** | **1,297** | **1,847** |
| 1992 | August | **All** | **-----** | **-----** | **2,167** |
| 1995 | September | **All** | **840** | **1,043** | **1,883** |
| | | *YOY* | *322* | *260* | *582* |
| | | *Other* | *518* | *783* | *1,301* |
| **LOWER CENTERVILLE CANAL** | | | | | |
| 1991 | ----- | **All** | **1,736** | **75** | **1,811** |
| 1995 | August | **All** | **332** | **72** | **404** |
| | | *YOY* | *256* | *2* | *258* |
| | | *Other* | *76* | *70* | *146* |
| 2002 | October | **All** | **3,314** | **74** | **3,388** |
| | | *YOY* | *2,147* | *62* | *2,209* |
| | | *Other* | *1,167* | *12* | *1,179* |
| 2005 | January | **All** | **546** | **3** | **549** |
| | | *YOY* | *238* | *0* | *238* |
| | | *Other* | *208* | *3* | *211* |

The Hendricks/Toadtown canal was also taken out of service in April 2005 and a fish rescue effort similar to that performed at Butte canal occurred from April 25 through 27, 2005. PG&E collected 1,300 trout in 10 segments. The catch was composed of roughly equal proportions of rainbow and brown trout (53 and 47 percent, respectively). Most fish (45 percent of the trout collected) were found in the segment from Velliquette Bridge to the confluence with Butte canal (table 3-21). Both rainbow and brown trout were in good condition with average K condition factors of 1.17 for rainbow (n=694) and 1.05 for brown trout (n=606) and the length frequency distribution for both rainbow and brown trout indicated that all age classes were present (figures 3-29 and 3-30).

Table 3-20. Summary of PG&E's fish rescue effort in Butte canal on April 25 and 26, 2005. (Source: PG&E 2007, as modified by staff)

| | | Trout Species | | |
|---|---|---|---|---|
| **Segment** | **Size of Fish** | **Brown** | **Rainbow** | **Total** |
| Butte Creek diversion dam to Cape Horn Road (≈6,000 feet) | All | 3 | 49 | 52 |
| | 0-4" | 0 | 2 | 2 |
| | 4-8" | 1 | 37 | 38 |
| | 8+" | 2 | 10 | 12 |
| Cape Horn Road to Kelsey Creek (≈4,500 feet) | All | 2 | 73 | 75 |
| | 0-4" | 0 | 9 | 9 |
| | 4-8" | 0 | 56 | 56 |
| | 8+" | 2 | 8 | 10 |
| Kelsey Creek to Clear Creek Point (≈5,500 feet) | All | 3 | 140 | 143 |
| | 0-4" | 0 | 21 | 21 |
| | 4-8" | 1 | 96 | 97 |
| | 8+" | 2 | 23 | 25 |
| Clear Creek Point to Camp 2 Road (≈7,000 feet) | All | 1 | 142 | 143 |
| | 0-4" | 0 | 21 | 21 |
| | 4-8" | 0 | 111 | 111 |
| | 8+" | 1 | 10 | 11 |
| Camp 2 Road to Butte Canal Siphon (≈7,000 feet) | All | 2 | 7 | 9 |
| | 0-4" | 0 | 2 | 2 |
| | 4-8" | 0 | 3 | 3 |

| Segment | Size of Fish | Trout Species | | Total |
|---|---|---|---|---|
| | 8+” | 2 | 2 | 4 |
| | All | 189 | 256 | 445 |
| Butte Canal Siphon to Pete Woods Mine Road (≈10,500 feet) | 0-4” | -- | 27 | -- |
| | 4-8” | -- | 137 | -- |
| | 8+” | -- | 92 | -- |
| | All | 62 | 4 | 66 |
| Pete Woods Mine Road to 9/1 Spill (≈4,000 feet) | 0-4” | 2 | 2 | 4 |
| | 4-8” | 40 | 1 | 41 |
| | 8+” | 20 | 1 | 21 |
| | All | 43 | 10 | 53 |
| 9/1 Spill to BW 15 (≈3,500 feet) | 0-4” | 2 | 1 | 3 |
| | 4-8” | 33 | 8 | 41 |
| | 8+” | 8 | 1 | 9 |
| | **TOTAL** | 305 | 681 | 986 |

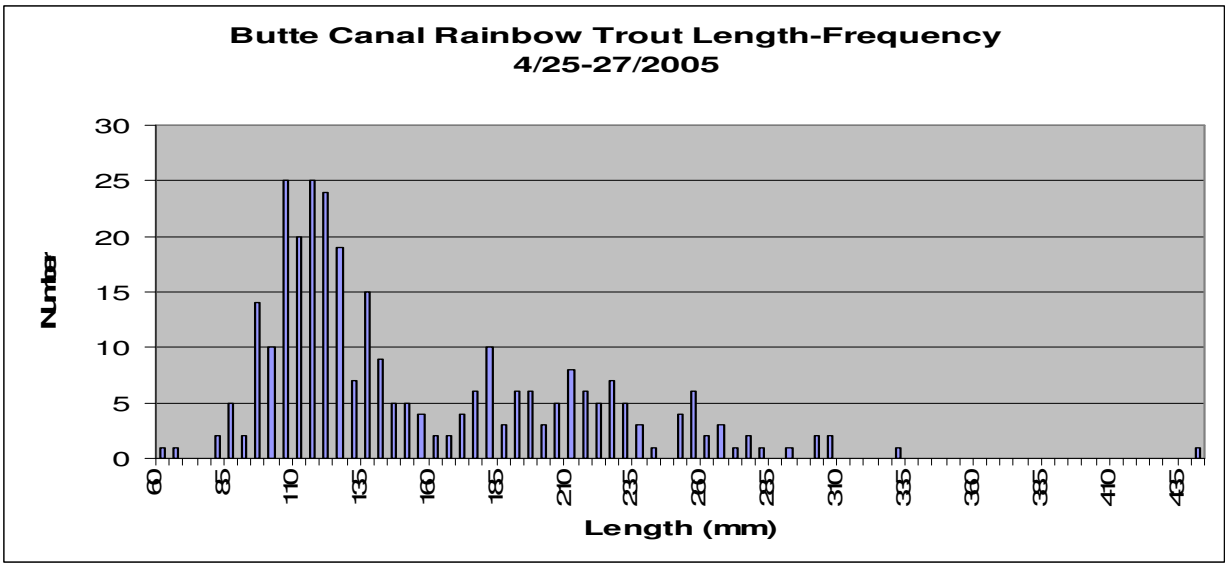


Figure 3-28. Length-frequency distribution of rainbow trout collected in Butte canal on April 25 and 27, 2005. (Source: PG&E 2007, as modified by staff)

Table 3-21. Summary of PG&E's fish rescue effort in Hendricks/Toadtown canal from April 25 through 27, 2005. (Source: PG&E 2007, as modified by staff)

| Segment | Size of Fish | Trout Species | | |
|---|---|---|---|---|
| | | Brown | Rainbow | Total |
| Hendricks Canal Tunnel to diversion dam (≈4,500 feet) | All | 4 | 249 | 253 |
| | 0-4" | 1 | 156 | 157 |
| | 4-8" | 3 | 88 | 91 |
| | 8+" | 0 | 5 | 5 |
| Long Ravine to 2/3 Flume (≈5,000 feet) | All | 6 | 3 | 9 |
| | 0-4" | 0 | 0 | 0 |
| | 4-8" | 0 | 0 | 0 |
| | 8+" | 6 | 3 | 9 |
| 2/3 Flume to Cunningham Ravine (≈6,500 feet) | All | 50 | 50 | 100 |
| | 0-4" | 3 | 13 | 16 |
| | 4-8" | 21 | 31 | 52 |
| | 8+" | 26 | 6 | 32 |
| Cunningham Ravine to Bob Isom's (≈9,500 feet) | All | 50 | 26 | 76 |
| | 0-4" | 20 | 12 | 32 |
| | 4-8" | 26 | 12 | 38 |
| | 8+" | 10 | 2 | 12 |
| Bob Isom's to Lovelock Tunnel (≈1,000 feet) | All | 10 | 6 | 16 |
| | 0-4" | 1 | 2 | 3 |
| | 4-8" | 9 | 4 | 13 |
| | 8+" | 0 | 0 | 0 |
| Lovelock Tunnel to Skyway (≈1,500 feet) | All | 13 | 2 | 15 |
| | 0-4" | 0 | 0 | 0 |
| | 4-8" | 0 | 0 | 0 |
| | 8+" | 13 | 2 | 15 |
| Skyway to Toadtown Diversioner Box (≈2,000 feet) | All | 28 | 7 | 35 |
| | 0-4" | 7 | 1 | 8 |

| Segment | Size of Fish | Trout Species | | |
|---|---|---|---|---|
| | | Brown | Rainbow | Total |
| | 4-8” | 14 | 5 | 19 |
| | 8+” | 7 | 1 | 8 |
| | All | 64 | 21 | 85 |
| Toadtown powerhouse to Toadtown Bridge (≈1,500 feet) | 0-4” | 18 | 5 | 23 |
| | 4-8” | 40 | 14 | 54 |
| | 8+” | 6 | 2 | 8 |
| | All | 95 | 25 | 120 |
| Toadtown Bridge to Velliquette Bridge (≈2,000 feet) | 0-4” | 49 | 19 | 68 |
| | 4-8” | 43 | 4 | 47 |
| | 8+” | 3 | 2 | 5 |
| | All | 280 | 305 | 585 |
| Velliquette Bridge to confluence with Butte Canal (≈7,500 feet) | 0-4” | 200 | 212 | 412 |
| | 4-8” | 72 | 83 | 155 |
| | 8+” | 8 | 10 | 18 |
| | TOTAL | 600 | 694 | 1,294 |

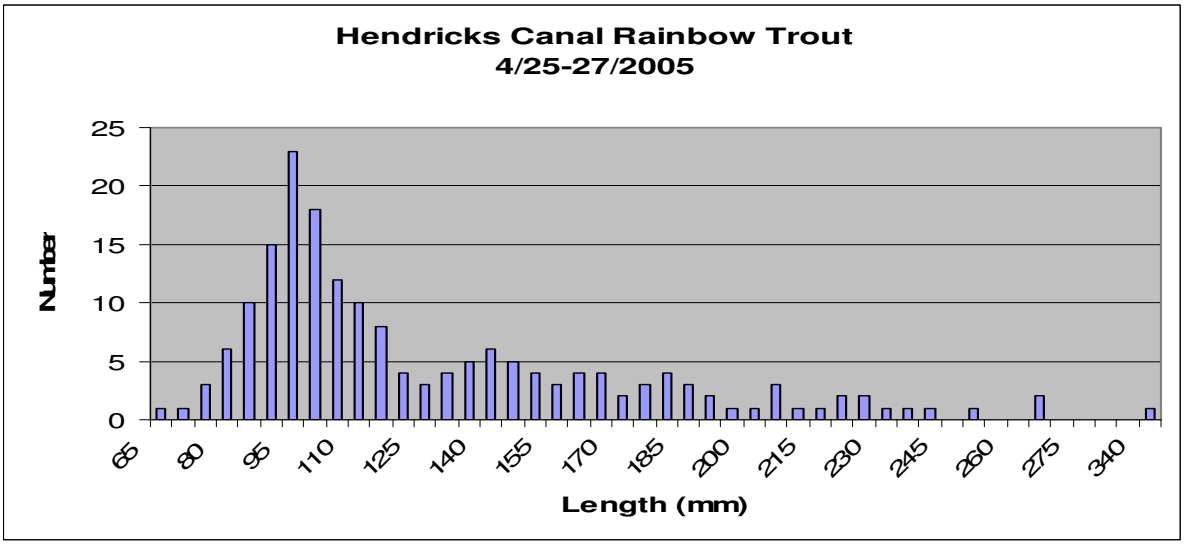


Figure 3-29. Length-frequency distribution of rainbow trout collected in Hendricks/Toadtown canal from April 25 through 27, 2005. (Source: PG&E 2007, as modified by staff)

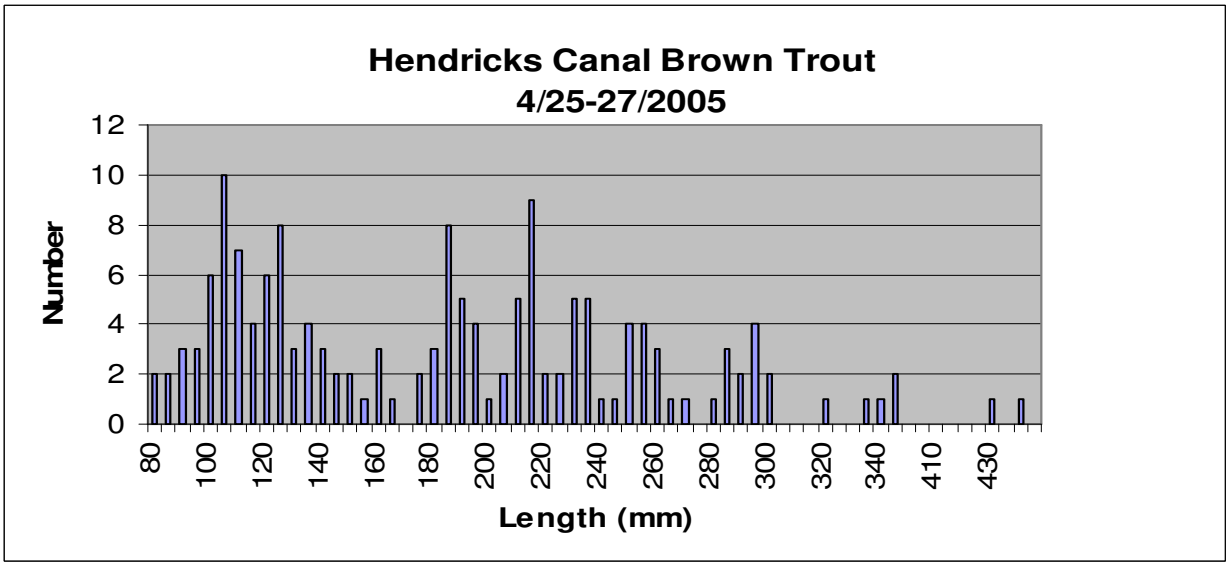


Figure 3-30. Length-frequency distribution of brown trout collected in Hendricks/Toadtown canal from April 25 through 27, 2005. (Source: PG&E 2007, as modified by staff)

Due to the heavy precipitation in Winter/Spring 2006, PG&E was required to perform an unscheduled outage of the canals for safety purposes. Because the 2006 outage was unscheduled, PG&E was only able to identify and count the number of fish rescued and was unable to collect length, weight and location data from the fish rescued

in 2006; however, this detailed information was collected during the 2007 canal outage (see table 3-22).

In February 2007, PG&E conducted a fish rescue on the Lower Centerville canal, and in April 2007, fish rescue efforts were conducted on the Hendricks/Toadtown canal and the Butte canal. The canals were dewatered immediately prior to fish rescue efforts as part of regularly scheduled maintenance (i.e., the morning of April 23rd for the Hendricks canal, and the morning of the 25th for the Butte canal).

A total of 694 fish were removed from the Hendricks/Toadtown canal; 1,371 fish were removed from the Butte canal (127 from the forks-to-forebay section); and 724 fish were removed from the Lower Centerville canal. Rainbow and brown trout were the only species captured and rainbow trout was the more abundant species (see table 3-22).

Table 3-22. Summary of PG&E's fish rescue efforts in 2006-2007 during outages. (Source: PG&E, 2007, as modified by staff)

| Date | Month | Size of Fish | Trout Species | | Total |
|---|---|---|---|---|---|
| | | | Rainbow | Brown | |
| **BUTTE CANAL** | | | | | |
| 2006 | May | All | 271 | 179 | 450 |
| | | 0-4" | 118 | 54 | 172 |
| | | 4-8" | 99 | 91 | 190 |
| | | 8-12" | 33 | 22 | 55 |
| | | 12+" | 21 | 12 | 33 |
| 2007 | April | All | 783 | 588 | 1,371 |
| | | 0-4" | 477 | 237 | 714 |
| | | 4-8" | 232 | 276 | 508 |
| | | 8-12" | 60 | 70 | 130 |
| | | 12+" | 14 | 5 | 19 |
| **HENDRICKS/TOADTOWN CANAL** | | | | | |
| 2006 | April | All | 185 | 441 | 626 |
| | | 0-4" | 159 | 322 | 481 |
| | | 4-8" | 11 | 88 | 99 |
| | | 8-12" | 13 | 25 | 38 |

| Date | Month | Size of Fish | Trout Species | | Total |
|---|---|---|---|---|---|
| | | | Rainbow | Brown | |
| | | 12+” | 2 | 6 | 8 |
| 2007 | April | All | 375 | 319 | 694 |
| | | 0-4” | 312 | 130 | 442 |
| | | 4-8” | 47 | 152 | 199 |
| | | 8-12” | 16 | 34 | 50 |
| | | 12+” | 0 | 3 | 3 |
| **LOWER CENTERVILLE CANAL** | | | | | |
| 2006 | January | All | 147 | 22 | 169 |
| | | 0-4” | 49 | 9 | 58 |
| | | 4-8” | 36 | 13 | 49 |
| | | 8-12” | 62 | 0 | 62 |
| | | 12+” | 0 | 0 | 0 |
| 2007 | February | All | 697 | 27 | 724 |
| | | 0-4” | 74 | 0 | 74 |
| | | 4-8” | 606 | 4 | 610 |
| | | 8-12” | 6 | 15 | 21 |
| | | 12+” | 11 | 8 | 19 |

*Spring-run Chinook Salmon of the Central Valley ESU*

Butte Creek spring-run Chinook salmon belong to the Central Valley evolutionarily significant unit (ESU) and are a California state and federally listed threatened species. California listed the species as threatened in February 1999. They were federally listed shortly thereafter in September 1999 [Federal Register Vol. 64, No. 179]. Critical Habitat for Butte Creek was designated in February 2000 [Federal Register Vol. 65, No. 32], and covers the reach downstream of Lower Centerville diversion dam to the confluence with the Sacramento River. In the project-affected reach, this includes Butte Creek from Lower Centerville diversion dam downstream to the Parrott-Phelan diversion dam.

The spring-run Chinook salmon is one of three runs occurring in Butte Creek, along with the fall- and late-fall runs. Because of its early migration timing, only the

spring-run regularly utilize habitat upstream of the Parrott-Phelan diversion dam. The fall- and late-fall runs only rarely migrate up to or beyond the Parrott-Phelan diversion dam. Adult fall-run and late-fall-run Chinook salmon enter Butte Creek downstream of the project area primarily from October through February and spawn shortly thereafter. Juvenile fall-run and late-fall run Chinook salmon emigrate as both young-of-the-year and yearlings, and are not readily distinguishable from downstream migrant spring-run Chinook salmon.

Butte, Deer, and Mill creeks support the majority of self-sustaining Central Valley spring-run Chinook salmon. Between 1995 and 2002, Butte Creek supported an average of 70 percent of the total Central Valley spring-run population (low = 45 percent; high = 89 percent).

Until the early to mid-1990s, the spring-run Chinook salmon had been in substantial decline. During a 10 year period from 1956 through 1965, the annual spring-run Chinook salmon escapement (run size) averaged about 2,800 fish, with an estimated high of 8,700 fish in 1960. During the next three decades, annual spring-run escapement averaged approximately 337 (1966 to 1975), 162 (1976 to 1985), and 1,354 (1986 to 1995). Ten fish were estimated for 1979.

Modifications to project operations to benefit spring-run Chinook salmon beginning in the 1980s and restoration actions initiated in the early 1990s under the Central Valley Project Improvement Act, have resulted in large numbers of adult spring-run Chinook salmon returning to Butte Creek in recent years, far in excess of historical numbers and restoration expectations. According to the FWS report, *Final Restoration Plan for the Anadromous Fishes Restoration Plan: January 9, 2001*, the production goal for spring-run Chinook salmon in Butte Creek was 2,000 returning adults. Since 1991, the Butte Creek population of spring-run Chinook salmon has far exceeded that goal, averaging 5,254 returning fish. In 1998, a year characterized as a wet water year with above normal precipitation, the Butte Creek spring-run Chinook salmon escapement hit a record high (since the population was monitored) of 20,212 fish. Recent data suggests even more fish returned to Butte Creek in 2001, based on mark-recapture carcass count data. The most recent data for 2003 estimated that more than 17,000 fish returned to Butte Creek.

Restoration of the Butte Creek population of spring-run Chinook salmon has been so successful that it is being considered as a source population for use in the restoration efforts for spring-run Chinook salmon in the San Joaquin River.[37]

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[37] Information provided by Friends of Butte Creek letter filed on May 28, 2009.

Adult spring-run Chinook salmon migrate from the ocean to the Sacramento River as immature fish beginning in early February, and arrive in Butte Creek in late February. The last adults to reach Butte Creek generally arrive by mid-June.

Prior to the installation of large dams, spring-run Chinook salmon used to migrate as far as they could travel in the large tributary streams to the Sacramento and San Joaquin rivers. In most years, the upstream migration limit in Butte Creek is the natural barrier at Quartz Bowl. For the next several months, the fish hold in deep pool habitats primarily from the confluence of Little Butte Creek upstream to the Quartz Bowl while they mature.

During the summer, spring-run Chinook salmon do not feed and continue to mature in the deep pools before spawning. Due to the low elevation of the Butte Creek holding and spawning habitat, ambient stream temperatures often exceed the reported temperature tolerances of spring-run Chinook salmon; although severe heat storms can result in temperatures that lead to spring-run Chinook salmon mortality in Butte Creek.

For example, during the last 2 weeks of July 2003, air temperatures exceeded 37.6°C (100°F) for 10 of 14 days. These air temperatures were in the upper 10 percent for the period of record. Consequently, water temperatures in key over-summer holding pools reached average daily temperatures of 20.9°C. The combination of the high numbers of returning adults confined to the limited number of holding pools and elevated air and water temperatures led to disease outbreaks of columnaris and ich (caused by the pathogens *Flavobacterium columnare* and *Ichthyophthirius multiphilis*, respectively), resulting in pre-spawn mortalities.

As temperatures cool in the fall, the mature fish move into nearby suitable spawning habitats. When suitable spawning habitat is found, female salmon dig nests called redds. Females then lay their eggs in the redds as the male fertilizes them. Once the eggs are covered with loose gravel and the spawning act is complete, the salmon die shortly thereafter. Eggs hatch after 40 to 60 days (depending on oxygen and temperature). The young fry remain in the gravel until their yolk sac is completely absorbed (4 to 6 weeks). Juvenile fish either emigrate shortly after emergence or rear in the stream for up to 15 months. In Butte Creek, the fry begin their downstream migration shortly after emerging from the gravel. Their downstream migration usually begins in mid-November and peaks between December and April. Between 1995 and 1998, and 1998 and 2000, 98.2 percent and 96.3 percent, respectively, of all young-of-the year spring-run Chinook salmon emigrated between December 1 and January 31; the average length of fry was 36 mm fork length for both sampling periods. A smaller number of fry emigrated in late spring or early summer.

Sutter bypass serves as a major nursery to the emigrating Butte Creek spring-run Chinook fry (Hill and Webber, 1999). Butte Creek fry rear in Sutter bypass for a period

of time before beginning their migration to the ocean. A small number of Butte Creek spring-run Chinook salmon emigrate as yearling fish (i.e., age 1+) during the following fall and winter. Most yearling spring-run Chinook salmon emigrate in October, but a few may emigrate as late as April.

Historically, spawning adult Central Valley spring-run Chinook salmon were mostly large 4 or 5 year old fish. Based on the size of present-day spawners, 3 year old fish are now generally the most common, which is likely the result of intense commercial fishing that removes the largest fish.

*Steelhead trout of the Central Valley ESU*

Steelhead are the anadromous form of rainbow trout. The Central Valley California ESU of steelhead trout is known to occur only in the Sacramento and San Joaquin rivers and their tributaries. The Sacramento and San Joaquin rivers provide the only migration route for anadromous fish to the drainages of the Sierra Nevada and southern Cascade mountain ranges. The Central Valley California ESU of steelhead trout, is federally listed as threatened (March, 1998, Federal Register Vol. 63, pages 32,996 to 32,998) but only for those runs in the Sacramento and San Joaquin rivers and their tributaries.

Data on Butte Creek steelhead in the project area are restricted to limited visual observations by anglers and Cal Fish & Game game wardens. There are no estimates of steelhead numbers for Butte Creek. Scientific data for these fish are also scarce. Available data is limited to Cal Fish & Game sampling conducted in various years at the irrigation diversions downstream of the project. Several steelhead adults have been reported at the Parrott-Phelan diversion dam during Cal Fish & Game trapping efforts in the winter and spring for juvenile spring-run Chinook salmon. However, it is doubtful that steelhead or salmon regularly ascended beyond the Quartz Pool barrier and the present site of the Lower Centerville diversion dam.

In California, adult steelhead are typically 3 to 4 years old before returning to the stream to spawn in gravel redds from December though March. Steelhead trout are also capable of spawning more than once during their lifetime. Between 6 to 7 weeks after the eggs are laid the young fish emerge from the gravel. Juvenile fish generally spend their first 2 years residing in freshwater before smoltification and migrating to the ocean.

Steelhead are believed to ascend Butte Creek in the late fall and winter. Spawning likely takes place through the winter and into the spring (generally December through April), upstream of Helltown bridge. Steelhead prefer to spawn in clean gravel at the pool-riffle transition. There is often substantial gene flow between anadromous and resident trout. It is not uncommon for male anadromous steelhead to mature and then assume a resident life style. As such, NMFS states that the resident rainbow trout population upstream of the Lower Centerville diversion dam has the potential to produce

offspring that exhibit a marine life history and therefore may be important to the recovery of the Central Valley steelhead.[38]

*Rainbow Trout*

Rainbow trout are perhaps the most popular gamefish in California, and in the project area. Rainbow trout are also regularly stocked in DeSabla forebay, Philbrook reservoir, and in Butte Creek near Butte Meadows upstream of the project.

As demonstrated by their flexible biology and life history behavior, individual growth rates and life span in rainbow trout can be variable. In small streams and high mountain lakes, rainbow trout seldom live longer than 6 years of age or grow larger than 40 cm total length. Most wild rainbow trout reach sexual maturity in their second or third year and usually spawn between February and June, depending on water temperature and strain. Rainbow trout spawn in gravel, usually in riffles. The eggs hatch in 80 days at 40°F (4.4°C) and 24 days at 55°F (12.7°C). The fry emerge from the gravel beginning 2 to 3 weeks later, depending upon temperature. Juvenile and adult rainbow trout may migrate into a lake or other downstream areas or remain in the stream defending a small home range.

For the first year or two of life, rainbow trout inhabit clear, cool, fast flowing water. Rainbow trout prefer streams with ample aquatic cover such as riparian vegetation or undercut banks. As the fish grow in size, habitats generally shift from riffles for the smallest fish to runs for intermediate sized fish and pools for the largest fish. Stream dwelling fish feed mostly on drifting invertebrates, but will also take benthic invertebrates. In lakes, feeding habits depend on the availability of prey. Rainbow trout in lakes may feed on zooplankton, benthic invertebrates, or small fish.

*Brown Trout*

Brown trout are known to occur in Butte Creek from Butte Meadows downstream to the Parrott-Phelan diversion dam, in Butte, Hendricks/Toadtown and Lower Centerville canals, in DeSabla forebay, and in West Branch Feather River. Brown trout are native to Europe, North Africa, and Western Asia. They were first introduced into California waters in 1893, and have since become a popular gamefish.

Brown trout prefer medium to large streams with swift riffles and large, deep pools, but can be found inhabiting a wide range of water bodies from small streams to large lakes and reservoirs. Growth in brown trout is variable and depends on a number of habitat conditions. Usually brown trout will grow faster in large lakes and reservoirs than in streams.

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[38] See NMFS comments on the draft EA, filed on February 27, 2009.

Brown trout mature in their second or third year and, depending on stream temperature, and will spawn during the fall or winter months (commonly, November or December in California). Brown trout begin their spawning migration as water levels rise (this may be as early as September). However, spawning sites are not chosen until stream temperatures have cooled to 6 to 10°C (43 to 50°F). Once the stream reaches the preferred temperature, females select a spawning site and begin digging a redd. This activity attracts a male who defends the female and nest against other males. When the pair have spawned, the eggs are covered with gravel upstream of the redd. Peak spawning activity generally does not occur until November and tapers off in December.

Eggs typically hatch in 7 to 8 weeks, depending on the stream temperature. After the brown trout hatch, they spend some time in the gravel absorbing the yolk sac. Once the yolk sac is absorbed, the young fry leave the redd and inhabit quiet water close to banks among large rocks or overhanging vegetation, typically June though October. Juvenile trout can inhabit a variety of habitats, from riffles to pools. Adults inhabit deep pools with deep cover and defend a feeding territory from other fish. Large brown trout are piscivorous and may prey on young of their own or of other fish species.

*California Roach*

California roach is a small minnow that is found in the reach of Butte Creek between Lower Centerville diversion dam and Parrott-Phelan diversion dam. California roach belong to the native assemblage of fish in the pikeminnow-hardhead-sucker zone and are native to the Sacramento River basin. Based on a combination of morphology, meristics, and zoogeography, eight forms of the California roach have been recognized. The Sacramento-San Joaquin roach is found in the drainages of the Sacramento and San Joaquin river system, except for the Pit River (which has its own form), and tributaries to San Francisco Bay.

California roach can be found in a wide variety of habitats, but are usually absent where normative piscivorous fishes are present. They are generally found in small warm streams, and are most abundant in the foothill streams of the western slope of the Sierra Nevada Mountains, and some coastal streams. Their tolerance for high temperatures (up to 30 to 35°C; 86 to 95°F) and low oxygen levels (1 to 2 parts per million) gives them the ability to inhabit habitats too harsh for most other species of fish.

Roach are omnivorous and feed on filamentous algae and benthic invertebrates. In some instances, roach may even take drift invertebrates suspended in the water column. Growth is seasonal and variable in roach. Roach grow fastest during the warm summer months, and depending on the stream, may take 1 or 2 years to reach 40 mm (1.6 inches) standard length.

Roach mature after reaching 45 to 60 mm (1.8 to 2.4 inches) standard length, usually at 2 to 3 years old. Spawning typically occurs when stream temperatures reach

16°C (61°F), from March through July. Spawning roach move from pools to areas of flowing water and a medium sized gravel substrate. Spawning occurs in large groups; females deposit a few eggs at a time among the crevices of the rocks. Males follow closely behind and fertilize the eggs as they are deposited. Eggs hatch in 2 to 3 days and the larvae remain in the rock crevices until they are large enough to actively swim.

*Hardhead*

Hardhead belong to the native assemblage of fish in the pikeminnow-hardhead-sucker zone and are native to the Sacramento River basin. In Butte Creek within the project area, hardhead are found from the Lower Centerville diversion dam to the Parrott-Phelan diversion dam. Although hardhead are not listed as threatened or endangered by either the stale or federal governments, they are identified as a sensitive species by the Forest Service.

Hardhead have a wide distribution, occurring in undisturbed mid- to low-elevation streams in the Sacramento-San Joaquin drainage and the Russian River. Hardhead prefer well-oxygenated water with summer temperatures in excess of 20°C (68°F). Laboratory experiments have determined that optimal temperatures for hardhead are between 24 and 28°C (75 and 82°F). They prefer deep pools (greater than 1 meter deep) with a sand-gravel-boulder substrate and slow velocities. In streams, adult hardhead typically position themselves in the lower half of the water column.

Hardhead usually occur in the same habitats as Sacramento suckers and Sacramento pikeminnow, and are almost never found in areas where pikeminnow are absent. Hardhead also tend to be absent from streams where nonnative centrarchids are the dominant fishes or in an environment that has been affected by humans. They are rarely found in large reservoirs.

Hardhead mature after they reach 3 or 4 years of age and spawn mainly in April and May, but may extend through August in some places. In small streams hardhead move only short distances either upstream or downstream to spawn.

Based on the fecundity of hardhead (10,000 to 20,000 eggs) mass spawning is the most likely means of spawning; eggs are likely broadcast over gravel riffles in streams, or over gravel areas along the margins of lakes and reservoirs.

Hardhead juveniles feed on aquatic insect larvae. At 20 cm (7.8 inches) standard length, hardhead begin feeding on aquatic plants and invertebrates in quiet water. Hardhead grow an average of 60 to 70 mm (2 to 3 inches) per year; as the fish get older the rate of growth eventually decreases. Usually hardhead can live up to 6 years, and can reach 460 mm (18 inches) fork length.

*Sacramento Pikeminnow*

Sacramento pikeminnow belong to the native assemblage of fish in the pikeminnow-hardhead-sucker zone and are native to the Sacramento-San Joaquin river basin. In Butte Creek within the project area, Sacramento pikeminnow are found from the Lower Centerville diversion dam to Parrott-Phelan diversion dam.

Sacramento pikeminnow are most abundant in intermittent and permanent streams (elevation of 100 to 650 meters [328 to 2,132 feet]) with warm summer temperatures. Pikeminnow generally inhabit waters with summer temperatures of 18 to 28°C. Within this range, pikeminnow often seek out the warmer temperatures, if other aspects of the habitat are suitable.

Sacramento pikeminnow reach maturity at 3 or 4 years of age, and reach 22 to 25 cm (8.6 to 9.8 inches) standard length. The spawning migration generally occurs after water temperatures reach 14°C (57°F) in April and May. In large streams (such as the Eel and Sacramento rivers), some Sacramento pikeminnow make spawning migrations of 100 to 400 km. Spawning begins April and May, and may extend through June. Sacramento pikeminnow spawn in gravel riffles or in shallow flowing areas at the tails of pools when water temperatures rise to 15 to 20°C (59 to 68°F).

Males appear on the spawning habitat first and congregate in nearby pools, waiting for passing females. When a female approaches the spawning habitat, she is immediately pursued by one to six males. Spawning occurs when the female dips down to release a small batch of eggs, while one to six males follow closely behind and simultaneously fertilize the eggs. The fertilized eggs sink to the bottom and adhere to the gravel substrate.

Sacramento pikeminnow fecundity is high (15,000 to 40,000 eggs per female, for fish 31 to 65 cm standard length). In a closely related species, the eggs of northern pikeminnow hatch in 4 to 7 days at 18°C, and the fry begin to school in another 7 days. After hatching, the young Sacramento pikeminnow require habitats with low velocities due to their limited swimming abilities and school in shallow pool edges.

Juvenile pikeminnow inhabit shallow pools and runs and prey on surface and benthic aquatic insects. Once the pikeminnow grow to 18 cm (7 inches) standard length, they become piscivorous and begin feeding on smaller fish and crayfish. Pikeminnow tend to occupy one area in a stream, but are also known to migrate upstream (when water level is high) or downstream (when water level is low) for food.

Unlike juveniles, adult pikeminnow are solitary and do not school, preferring to occupy deep pools with an adequate amount of shade, and a sandy/boulder substrate. During the day, adults tend to take cover underneath rock ledges and logs, coming out at night to actively seek out prey.

*Sacramento Sucker*

Sacramento suckers belong to the native assemblage of fish in the pikeminnow-hardhead-sucker zone and are native to the Sacramento-San Joaquin river basin. In Butte Creek within the project area they are found from Lower Centerville diversion dam to Parrott-Phelan diversion dam.

Sacramento suckers are found in a wide variety of water bodies, from cold mountain streams to warm, sluggish rivers on the valley floor. Suckers are also found in many lakes and reservoirs. They are most abundant in clear, cool rivers and streams and lakes and reservoirs at moderate elevations (200 to 600 m; 656 to 1968 feet). Adults prefer large streams and juveniles are most common in the small tributary streams where they hatched.

Sacramento suckers do well in a wide range of temperatures. They can be found in cold mountain streams where temperatures rarely exceed 15 to 16°C (59 to 61°F), or small foothill streams where summer temperatures may reach 29 to 30°C (84 to 86°F), but seem to prefer temperatures of 20 to 25°C (68 to 77°F), which may be best for growth.

Sacramento suckers first spawn between 4 and 6 years of age at 200 to 320 mm (7.8 to 12.5 inches) fork length. The spawning migration is triggered when water temperatures warm to 5.6 to 10.6°C (42 to 51°F) and flows increase, and may begin as early as late December. A sudden cold snap can also halt the run until warmer temperatures return. Suckers have been known to migrate more than 50 km (31 miles) upstream to spawn.

Depending on water temperatures, spawning generally takes place from February through June, and peaks in March and April. Spawning behavior is typical of most suckers. Large congregations of suckers gather in the spawning area and individual females are accompanied by two to seven males. In tributaries, suckers will spawn over gravel riffles; in lakes they may spawn along shorelines; when spawning is complete, adults return to the larger streams/rivers or lakes/reservoirs.

Habitat requirements for the Sacramento sucker vary with life stage. Larval suckers concentrate in the warm, quiet, protected stream margins. Juvenile suckers (less than 50 mm; 1.9 inches standard length) commonly remain in the tributary streams where they hatched and stay on or close to the bottom at depths of 20 to 60 cm (8 to 24 inches), foraging in shallow, slow-flowing (less than 10 cm/sec; less than 0.3 feet/sec) water along the stream margins.

Sub-adult suckers may leave the spawning tributaries and migrate downstream to larger bodies of water where they inhabit deep pools, runs, or undercut banks near riffles during the day. Adult suckers are commonly found in aggregations in pools, each sucker

orientating itself to optimal foraging positions in a stream. Adults prefer depths greater than 3 feet where they are relatively safe from avian predators such as herons, osprey, and bald eagles.

Suckers are most active at night, when they move into riffles to forage. Their diet consists mainly of algae, diatoms, and invertebrates. Post-larval suckers have a short digestive tract and terminal mouth and feed primarily on early instars of insects in the water column and at the water's surface. As they develop, their mouths become subterminal and digestive tracts lengthen. During this time, their diet shifts toward diatoms, filamentous algae, and protozoa. The diet of adult suckers is made up mostly of filamentous algae, diatoms, and detritus. Less than 20 percent of their diet is made up of invertebrates. Depending on local conditions, Sacramento suckers may grow 12 to 87 mm (0.7 to 3.4 inches) per year and exceed 10 years of age and 50 cm (20 inches) in length in large water bodies.

*Tule Perch*

Tule perch primarily inhabit low elevation streams, where they inhabit a range of habitat types from sluggish turbid channels to clear, swift-flowing sections. Tule perch have been observed in Butte Creek downstream of Centerville powerhouse, but are likely to occur upstream of the powerhouse as well.

Tule perch give birth to live young. Mating occurs during July to September, with the female storing the sperm until about January, when the eggs are fertilized. Young are born in May or June. From 22 to 83 young are produced per female, with larger females having more young. Tule perch become sexually mature shortly after birth. Growth in tule perch is most rapid during the first 18 months after birth, when they are 3 to 4 cm (1.2 to 1.4 inches) standard length. Tule perch seldom exceed 16 cm (6.3 inches) standard length, or 5 years of age.

*Riffle Sculpin*

Riffle sculpin are commonly associated with both the pikeminnow-hardhead-sucker and rainbow trout assemblages and are native to the Sacramento River basin. In Butte Creek in the project area, they are found from Lower Centerville diversion dam to Parrott-Phelan diversion dam.

Riffle sculpin are most commonly found in permanent cool mountain streams with abundant riffle habitat. They prefer relatively shallow water that flows swiftly over a rocky substrate. In small streams, they may occupy well-shaded pools with good cover such as undercut banks, submerged logs, boulder/cobble substrate, or other complex cover. Riffle sculpin are abundant in streams where temperatures do not exceed 25 to 26°C for extended periods, and DO levels are at or near saturation.

Riffle sculpin first spawn at 2 years of age at 60 to 80 mm (2.3 to 3.1 inches) standard length. Spawning begins in late February and continues through April. Riffle sculpin spawn on the underside of rocks or inside the cavities of submerged logs. After spawning, males guard the developing embryos and emerged larvae in the nest until the fry, have developed and left the nest. Riffle sculpin grow about 6 mm (0.02 inches) per month during their first year, reaching a length of 25 to 45 mm (1 to 1.7 inches) standard length by the end of the first growing season. Two year old fish average 40 to 50 mm (1.6 to 2 inches) standard length, and 3 year old fish, 50 to 60 mm (2 to 2.3 inches). Riffle sculpin rarely live longer than 4 years.

*Aquatic Molluscs*

Aquatic molluscs previously identified in the project area included four species in the families *Lymnaeidae* and *Physidae*, which were collected in lower Butte Creek by Cal Fish & Game during benthic macroinvertebrate sampling in 1999 and 2000. All of these snails have a relatively high tolerance to disturbance or pollution (California tolerance values of 6-8) and are not special status species.

Two aquatic mollusc species were targeted for survey during this study because of their sensitive status and the possibility that they might exist in areas affected by the project: *Anodonta californiensis* (California floater mussel) and *Juga occata* (scalloped juga), which are Forest Service sensitive species. Historically, the California floater is believed to have been found throughout the western United States, ranging from Washington, Oregon, and California. This species was found within the Susan River drainage (Lassen County) northeast of the project area (Brim Box, 2002). The scalloped juga historically occurred in the Sacramento River and in the Pit River. Neither target mollusc species were found during the licensing studies in projected affected stream reaches or in the unaffected reference reaches. However, licensing studies did identify, in total, seven gastropod species in the families Pleuriceridae, Physidae, Hydrobiidae, Lymnaeidae, and Planorbidae, and one bivalve species in the family Spheridae.

*Benthic Macroinvertebrates*

During licensing studies, PG&E collected samples of benthic macroinvertebrates at 25 sites: 8 sites in the Butte Creek watershed and 17 sites in the West Branch Feather River watershed. This sampling included eight reference sites, each one sampled upstream of the following project dams/diversions: Inskip, Kelsey, Clear, Cunningham Ravine, Little West Fork, Long Ravine, and Coon Hollow upstream of Hendricks diversion dam. Benthic sample processing was performed as outlined in the California Stream Bioassessment Procedure. From the 25 sites, including one of the site duplicates, 23,600 organisms were subsampled comprising 135 distinct taxa, 65 EPT taxa and 17 Coleoptera taxa.

### 3.3.2.2 Environmental Effects

#### Water Quantity

*Minimum Instream Flows*

PG&E proposes as soon as reasonably feasible and within 3 months of license issuance, to release the minimum instream flows proposed and discussed below. PG&E proposes its minimum instream flow schedule shall be at the rates proposed, or actual inflow at the point of diversion, whichever is less. PG&E also proposes, consistent with Forest Service modified 4(e) condition 18.1, FWS 10(j) recommendation 2, and NMFS 10(j) recommendation 2, that a specific minimum instream flow release may be temporarily modified if required by equipment malfunction, law enforcement/rescue activity, operating emergencies reasonably beyond its control, or by the specific request of the resource agencies and that if this occurs, PG&E would provide notice and an explanation to the Commission as soon as possible, but no later than 10 days after each incident. The Forest Service further specifies, and FWS and NMFS recommend, that in such instances, PG&E would make all reasonable efforts to promptly resume performance of requirements and notify agencies within 48 hours of the modification.

The Forest Service specifies in modified 4(e) condition 18.1, that PG&E schedule the timing of maintenance or other planned project outages to avoid negative ecological effects from the resultant spills and that written notice be provided to the Forest Service 90 days prior to any planned maintenance outages that would affect stream flows in Philbrook Creek and in reaches of the West Branch Feather River. The Forest Service also specifies that this notification include a description of project and coordinated measures PG&E proposes to minimize the magnitude and duration of spills into the project reach.

Where facility modification is required to implement a specific minimum instream flow, PG&E, consistent with Forest Service modified 4(e) condition 18.1, proposes to complete such modifications as soon as reasonably practicable and no later than 3 years after license issuance. The Forest Service in modified 4(e) condition 18.1 specifies, and FWS in 10(j) recommendation 2 and NMFS in 10(j) recommendation 2, recommend, that where facility modification is required to implement the efficient release of minimum instream flows, PG&E shall submit applications for permits within 1 year after license issuance and complete such modifications as soon as reasonably practicable but no later than 2 years after receipt of all required permits and approvals.

In its July 30, 2008, alternative 4(e) conditions filed with the Forest Service, PG&E states that facility modifications such as those needed for flow releases or temperature control device design and installation in DeSabla forebay may prevent minimum instream flows from commencing within 90 days of license issuance, as recommended by FWS, Cal Fish & Game, and NMFS. This proposal by PG&E is

consistent with Forest Service modified 4(e) condition 18.1, which acknowledges modifications to project facilities may prevent minimum instream flow releases from being implemented within 90 days; however, the Forest Service specifies that PG&E make a good faith effort to provide the specified minimum instream flows within the capabilities of the existing project facilities.

The Conservation Groups state in their recommendations they support those minimum instream flows proposed by PG&E, except for those proposed for downstream of the Hendricks diversion dam in dry water years, as described below.

*Our Analysis*

Implementing minimum instream flows required by any license issued within 90 days of license issuance, as proposed by PG&E and as required by the Forest Service and recommended by Cal Fish & Game, FWS, and NMFS, would ensure required minimum instream flows would be provided as soon as possible to protect aquatic resources in project-affected bypassed reaches. It is likely that if project facilities need to be modified, minimum instream flows in certain bypassed reaches may not be able to be implemented within 90 days of any license issued for this project. However, implementing minimum instream flows immediately after these modifications would ensure aquatic resources are protected as soon as possible.

If a specific minimum instream flow is temporarily modified due to equipment malfunction, law enforcement/rescue activity, or operating emergencies reasonably beyond PG&E's control, PG&E's proposal, which is consistent with the requirements of the Forest Service, and recommendations by FWS and NMFS, to provide notice and an explanation to the Commission as soon as possible, but no later than 10 days after each incident, would assist the Commission in documenting compliance with any license issued for this project.

Resuming any required minimum instream flows as soon as possible, as specified by the Forest Service, and as recommended by FWS and NMFS, and providing notice to the agencies within 48 hours of the modification, would help minimize any negative effects to aquatic resources and ensure the agencies would be informed about these modifications which may affect resources in project-affected reaches. Also, as specified by Forest Service modified 4(e) condition 18.1, scheduling the timing of project maintenance activities or other planned outages to avoid negative ecological effects and providing a description of measures that PG&E would implement to minimize the magnitude and duration of spills into the project reach at least 90 days before any planned outages would further reduce any negative effects on the aquatic resources in the project bypassed reaches.

*Upper West Branch Feather River-Downstream of Round Valley Reservoir Dam*

Consistent with Forest Service modified 4(e) condition 18, FWS 10(j) recommendation 2.4, and Cal Fish & Game 10(j) recommendation 1, PG&E proposes to release 0.5 cfs, or inflow, during normal water years, and 0.1 cfs, or inflow, during dry water years, on a year-round basis downstream of Round Valley reservoir dam on the upper West Branch Feather River. This proposal is consistent with the minimum instream flows under the current license.

The California Salmon and Steelhead Association (CSSA) recommends that Round Valley reservoir be increased in size to increase available cold-water storage for the benefit of downstream aquatic resources in both Butte Creek and the West Branch Feather River.

*Our Analysis*

Under current and proposed project operations, water is released from Round Valley reservoir to supplement flows in the upper West Branch Feather River. Flows are then diverted at Hendricks diversion dam in an effort to increase flows and reduce water temperatures in lower Butte Creek for the benefit of spring-run Chinook salmon. Flows are released from Round Valley reservoir as soon as space becomes available in Hendricks canal, typically in June.

Water temperatures warm quickly in Round Valley reservoir due to its shallow nature, with releases from 2004 through 2006 (July to August) ranging from 17.5 to 24.1°C. Round Valley reservoir, which currently does not have a minimum pool requirement, is typically drained in one months time to minimize negative impacts on aquatic resources due to releases from this reservoir warming later in the summer. Therefore, by late July or early August, the West Branch Feather River downstream of Round Valley reservoir dam is an intermittent stream containing only isolated pools. Because of the intermittent flows in the upper West Branch Feather River from downstream of Round Valley reservoir to its confluence with Coon Hollow Creek, an approximate 1.3-mile-long reach, a wetted-perimeter study was conducted by PG&E to quantify the available aquatic habitat in this reach based on different flows.

Figure 3-31 illustrates the results of this wetted-perimeter study for the upper West Branch Feather River between Round Valley reservoir and Coon Hollow Creek. Results indicate that wetted-perimeter increases with flow in a generally non-linear pattern, with the greatest gains (per cfs) in wetted-perimeter occurring in the 1 to 6 cfs range. Limited additional gains in wetted-perimeter were observed between 6 and 13.5 cfs.

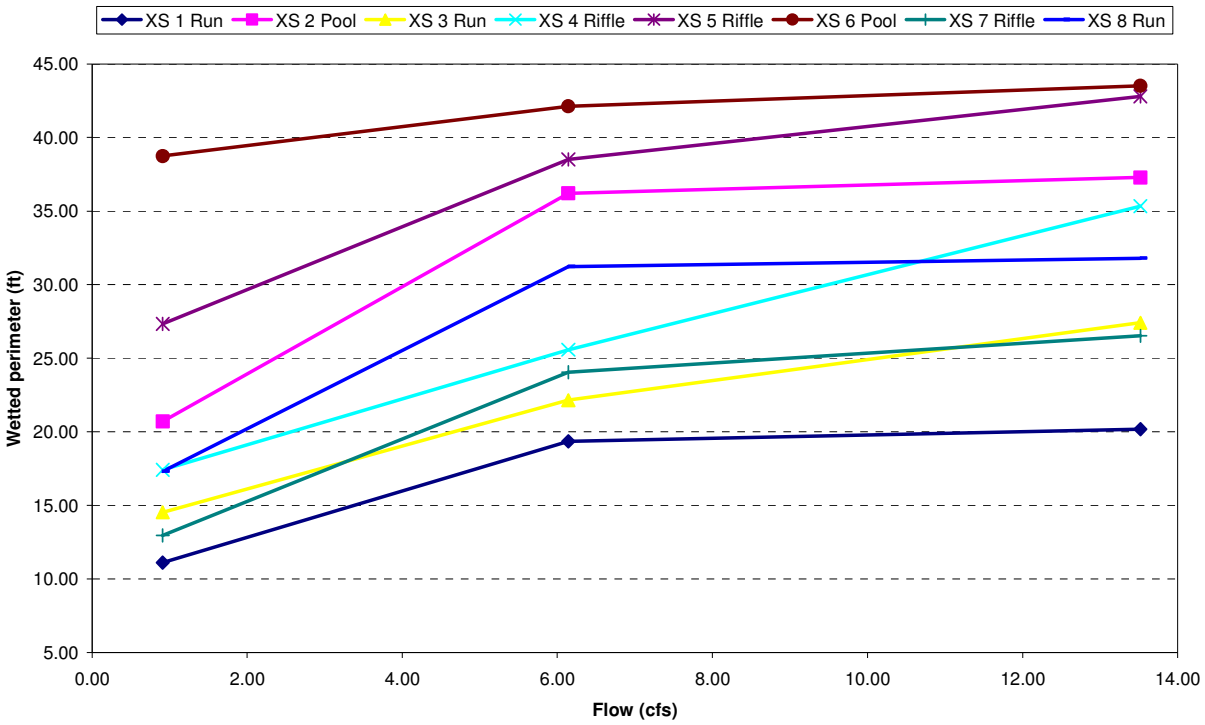


Figure 3-31. Wetted-perimeter versus (in cfs) flow at the Round Valley study site on the upper West Branch Feather River. (Source: PG&E, 2007a)

As discussed above, storing water for release from Round Valley reservoir may create conditions which are likely to negatively affect aquatic resources in the reach downstream of Round Valley reservoir, especially later in the summer when releases have subsided. PG&E's proposal, which is consistent with Forest Service modified 4(e) condition 18, FWS 10(j) recommendation 2.4, and Cal Fish & Game 10(j) recommendation 1, would release 0.5 cfs, or inflow, during normal water years, and 0.1 cfs, or inflow, during dry water years, on a year-round basis downstream of Round Valley reservoir dam. As shown in figure 3-31, these minimum instream flows would likely provide minimal habitat for resident aquatic species in this reach and potentially cause elevated water temperatures due to the quickness in which water temperatures warm within the reservoir and in the upper West Branch Feather River. Based upon figure 3-31, a minimum instream flow upwards of 6 cfs would provide a greater amount of habitat for aquatic species present in this reach.

However, a complex tradeoff exists in the upper West Branch Feather River. To provide additional, cooler water temperatures in lower Butte Creek, water needs to be stored in Round Valley reservoir for rapid release in early-summer, before water temperatures warm to levels likely to adversely affect aquatic resources, including spring-run Chinook salmon, in the Butte Creek drainage. Although releasing a minimum instream flow upwards of 6 cfs would result in a greater amount of available habitat in

the upper West Branch Feather River for aquatic organisms, this would also result in draining the reservoir sooner compared to existing and proposed project operations, reducing the storage pool of available water.

Draining Round Valley reservoir prior to the onset of warmer summer temperatures by increasing minimum instream flow releases would likely necessitate releasing water from Philbrook reservoir sooner that what currently occurs. This has the potential to increase water temperatures in Philbrook reservoir as reduced storage would lead to increased rates of thermal loading within the reservoir, likely leading to increased water temperatures for instream flows. Therefore, a minimum instream flow of 0.5 cfs, or inflow, during normal water years, and 0.1 cfs, or inflow, during dry water years, would continue to ensure an ample storage pool of water is available to reduce water temperatures within lower Butte Creek. Also, under existing conditions, minimum instream flows support self-sustaining populations of rainbow trout, indicating that continuing to implement these minimum instream flows would likely continue to support these populations.

There is little evidence that increasing the size of Round Valley reservoir as recommended by the CSSA would increase cold water storage of this reservoir. Increasing the size of this reservoir would also increase its surface area, potentially making it susceptible to greater thermal warming. Further, it is likely that either excavating the reservoir, or increasing the height of the dam, would have numerous negative environmental affects, including the inundation of an unknown amount of land surrounding the reservoir, leading to increased erosion and sedimentation.

*Upper West Branch Feather River-Philbrook Creek*

PG&E proposes a year-round minimum instream flow of 2 cfs, or inflow, in Philbrook Creek, regardless of water year type. PG&E also proposes that when the inflow into Philbrook reservoir is less than 0.1 cfs, a minimum instream flow of 0.1 cfs would be released. This proposal is consistent with minimum instream flows under the existing license.

PG&E's proposal for a 2 cfs minimum instream flow is consistent with FWS 10(j) recommendation 2.5, Cal Fish & Game 10(j) recommendation 1, and Forest Service modified 4(e) condition 18.1; however, the Forest Service further specifies, and FWS and Cal Fish & Game further recommend, that increases to minimum instream flows in Philbrook Creek could occur and would be determined by the snow water equivalent measured at the Humbug California Department of Water Resources (DWR) snow pillow sensor (HMB #823), located at an elevation of approximately 6,500 feet msl. In years where the snow water equivalent at this site is at least 40 inches on April 1st, and 30 inches on May 1st, FWS and Cal Fish & Game recommend a minimum instream flow of 10 cfs be released to Philbrook Creek between April 1st and May 15th. The Forest

Service requirement is consistent with FWS and Cal Fish & Game's recommendations; however, only a snow water equivalent at this site of at least 40 inches on April 1st would trigger an increase in minimum instream flow. The Forest Service specifies that the actual minimum instream flow in this reach would be agreed to by PG&E, in consultation with the Forest Service, based on the snow water equivalent measurements and the prediction of spill magnitudes. The Forest Service specifies, and FWS and Cal Fish & Game recommend, that if PG&E determines that Philbrook reservoir will not fill to capacity despite the snow pack levels, minimum instream flows may be altered following consultation with the agencies.

FWS, in 10(j) recommendation 2.5, further recommends that when the inflow into Philbrook reservoir is less than 1 cfs, a minimum instream flow of at least 1 cfs would be discharged into Philbrook Creek. The Forest Service in modified 4(e) condition 18.1 specifies that if instantaneous inflows into Philbrook reservoir are less than 0.5 cfs, the mean daily minimum instream flows released to Philbrook Creek shall be 1 cfs.

CSSA recommends that PG&E provide a minimum instream flow downstream of Philbrook dam, and that PG&E manage the cold water of Philbrook reservoir to provide cold water for downstream reaches.

In its July 30, 2008, alternative 4(e) conditions filed with the Forest Service, PG&E proposed to adopt the portion of Forest Service 4(e) condition 18 that specified minimum instream flows for Philbrook Creek, as described above. Also, during the April 13, 2009, section 10(j) meeting, PG&E indicated it supported this increase in minimum instream flows during wet water years, provided PG&E employees could safely access the minimum instream flow release valve at Philbrook dam.

*Our Analysis*

Currently, rainbow trout and a small number of brown trout are present in Philbrook Creek, which are maintained via Cal Fish & Game's yearly stocking program. The existing year-round minimum instream flow in this reach is 2 cfs, which is consistent with PG&E's proposal, Forest Service requirements, and recommendations from Cal Fish & Game, FWS, and CSSA. A 2 cfs minimum instream flow provides a weighted useable area (WUA) of approximately 16 percent of the available rainbow trout spawning habitat in both wet and dry years.[39] In Philbrook Creek, WUA for adult rainbow trout is maximized at moderate discharges (between 75 and 95 cfs; figure 3-32). WUA for rainbow trout fry is maximized at the lower modeled discharges (between 5 and 10 cfs) and decreases with increasing discharge, as fry typically rear in slow, shallow water

[39] Weighted Usable Area is the amount of usable habitat available for a given fish species.

(figure 3-32). WUA for juvenile and spawning rainbow trout habitat are maximized at flows between 35 and 60 cfs (figure 3-32).

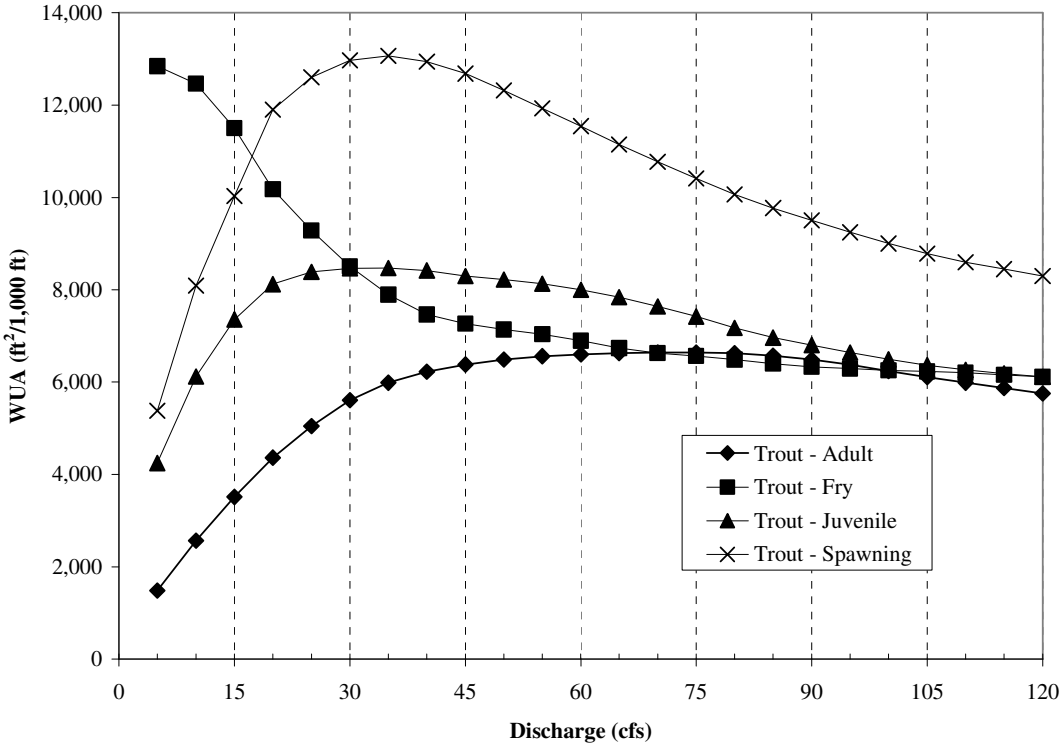


Figure 3-32. Weighted Usable Area (habitat) versus discharge (flow) relationship for spawning, adult, juvenile, and fry life stages of rainbow trout in Philbrook Creek. (Source: PG&E, 2007a)

In the Forest Service's February 26, 2009, comment letter on the draft EA, and during the April 13, 2009, section 10(j) meeting, additional information was provided on the effects of implementing an increase in minimum instream flows between April 1st and May 15th during designated wet years. The Forest Service stated that the parameters of increasing the spring minimum instream flow to 10 cfs in wet years for Philbrook reservoir were analyzed in collaboration with relicensing participants and PG&E, and that implementing its required minimum instream flow would not compromise storage levels within Philbrook reservoir or instream water temperatures during the summer months. PG&E confirmed this statement during the section 10(j) meeting, indicating that during wet years, once the reservoir is filled, oftentimes excess water is spilled into the spill channel of Philbrook reservoir. PG&E further agreed that in wet years it is likely this increased minimum instream flow could be made without compromising storage, provided PG&E employees can safely access the release valve at the main dam.

Typically, rainbow trout in Philbrook Creek would spawn between April and June, when unregulated, natural flows in Philbrook Creek would likely be the greatest as a

result of snowpack runoff. However, PG&E's existing and proposed year-round minimum instream flow of 2 cfs would likely continue to limit spawning habitat for this species during this time period. Under the Forest Service's requirement, and recommendations from FWS and Cal Fish & Game, instream flows would be increased from 2 to 10 cfs between April 1 through May 15 in designated wet years, based upon snowpack levels, in an effort to provide additional stream flow in Philbrook Creek to increase rainbow trout spawning habitat. Increasing instream flows in this reach to 10 cfs would increase the available WUA of rainbow trout spawning habitat from 16 to 62 percent, providing approximately 6,000 additional square feet of suitable spawning habitat, as well as increase adult rainbow trout and juvenile rainbow trout habitat (see figure 3-32).

Discussions at the April 13, 2009, section 10(j) meeting clarified that providing these increased minimum instream flows to Philbrook Creek would not compromise storage within the reservoir as this excess water is oftentimes spilled. This increase in minimum instream flows would also reduce excess spill water, likely reducing erosion that occurs in the Philbrook spillway channel as a result of high discharge spillway events (see section 3.3.1.2, *Geologic and Soil Resources*). Consulting with the resource agencies prior to April 1 and throughout the increased minimum instream flow release period would ensure there is sufficient snowpack to maintain these minimum instream flows in Philbrook Creek without impacting reservoir storage. If snowpack and runoff conditions indicate reservoir storage is in jeopardy as a result of releasing these increased minimum instream flows, altering or reducing these minimum instream flows, in consultation with the agencies, would preserve storage for release later in the year.

CSSA's recommendation for PG&E to manage the cold water storage within Philbrook reservoir for the benefit of downstream reaches is consistent with current project operations and PG&E's proposal. We further discuss managing Philbrook reservoir operations below under the *Annual Consultation, Long-term Operations, and Adaptive Management* section.

*Lower West Branch Feather River-Downstream of Hendricks Diversion Dam*

The existing license requires that PG&E release on a year-round basis, 15 cfs downstream of Hendricks diversion dam during normal water years and 7 cfs during dry water years. PG&E proposes to release the minimum instream flows shown in table 3-23 downstream of the Hendricks diversion dam. Table 3-23 also shows minimum instream flows specified by the Forest Service, and recommended by the agencies and Conservation Groups for this reach, including those contained in: Forest Service modified 4(e) condition 18.1, FWS 10(j) recommendation 2.3, Cal Fish & Game 10(j) recommendation 1, and the Conservation Groups proposed alternative 4(e) condition

18.[40] CSSA recommends increasing minimum instream flows downstream of Hendricks diversion dam to provide additional habitat for resident brown and rainbow trout.

Table 3-23. Comparison of PG&E's existing and proposed, Forest Service required, and agency and Conservation Groups recommended instream flows for the lower West Branch Feather River downstream of Hendricks diversion dam. (Source: Staff)

| | PG&E's Existing Instream Flow (cfs) by Water Year | | PG&E's Proposed Instream Flow (cfs) by Water Year | | Agency Instream Flow (cfs) by Water Year[a] | | Conservation Groups Alt. 4(e) Instream Flow (cfs) by Water Year[b] | |
|---|---|---|---|---|---|---|---|---|
| **Month** | **Normal** | **Dry** | **Normal** | **Dry** | **Normal** | **Dry** | **Normal** | **Dry** |
| September | 15 | 7 | 20 | 7 | 20 | 7 | 20 | 15 |
| October | 15 | 7 | 20 | 7 | 20 | 7 | 20 | 15 |
| November | 15 | 7 | 20 | 7 | 20 | 7 | 20 | 7 |
| December | 15 | 7 | 20 | 7 | 20 | 7 | 20 | 7 |
| January | 15 | 7 | 20 | 7 | 20 | 7 | 20 | 7 |
| February | 15 | 7 | 20 | 7 | 20 | 7 | 20 | 7 |
| March | 15 | 7 | 30 | 20 | 30 | 20 | 30 | 20 |
| April | 15 | 7 | 30 | 20 | 30 | 20 | 30 | 20 |
| May | 15 | 7 | 30 | 20 | 30 | 20 | 30 | 20 |
| June | 15 | 7 | 20 | **7** | 30 | 15 | 20 | 15 |
| July | 15 | 7 | 20 | **7** | 30 | 15 | 20 | 15 |
| August | 15 | 7 | 20 | **7** | 30 | 15 | 20 | 15 |

[a] Agencies include Forest Service, FWS, and Cal Fish & Game.

[b] Conservation Groups include California Sportfishing Protection Alliance, Friends of Butte Creek, American Whitewater, and Friends of the River.

[40] We note that recommendations filed by the Conservation Groups on June 27, 2008, recommend a minimum instream flow release of 15 cfs in dry water year types downstream of Hendricks diversion dam from June 1 through February 28; however, we assume the proposed alternative 4(e) conditions filed on July 29, 2008, are the group's current recommendation.

The Forest Service in modified 10(a) recommendation 20 and Cal Fish & Game in 10(j) recommendation 13, recommend that flows made available through minimum instream flow release at Hendricks diversion dam be maintained within the West Branch Feather River downstream along the natural stream course to its discharge at the high-water line of Lake Oroville. The Forest Service further recommends that PG&E should make a good faith effort to ensure that minimum instream flows measured at the gage immediately downstream of Hendricks diversion dam (PG&E gage no. BW 95) are not diverted from the West Branch Feather River through methods under the control of the PG&E, for any purpose.

The Forest Service in modified 10(a) recommendation 20 and Cal Fish & Game in 10(j) recommendation 13, recommend that PG&E consult with the Water Board and other resource agencies with responsibilities for the protection of aquatic resources, to identify water rights associated with the diversion of water from the West Branch Feather River and file with the Water Board, petitions to change the purpose of use for existing water rights held by PG&E that define the West Branch Feather River as an authorized point of diversion. The Forest Service and Cal Fish & Game further recommend that petitions for change on each West Branch Feather River water right should specify the desired change to include the addition of a purpose of use described as Water Code section 1707 instream flow dedication to the West Branch Feather River and that PG&E, in consultation with the Water Board and other resource agencies, develop a plan for flow measurement that will demonstrate continued maintenance of section 1707 minimum instream flow dedication within the West Branch Feather River drainage.

The Conservation Groups filed alternative 4(e) conditions on July 29, 2008 (Conservation Groups, 2008). The Conservation Groups proposed an alternative condition to Forest Service preliminary 4(e) condition 18.1 which addresses minimum instream flows downstream of the Hendricks diversion dam, as shown in table 3-23. In their recommendations, the Conservation Groups also recommend that minimum instream flows downstream of Hendricks diversion dam would not become effective until the physical fix to the DeSabla forebay is in place and functioning.

CSSA recommends that PG&E release sufficient water and maintain flows below the Miocene diversion dam in the West Branch Feather River downstream to Oroville reservoir on a year-round basis. CSSA further recommends a daily flow of at least 30 cfs when the Miocene diversion dam is not spilling. Lastly, CSSA recommends that water be piped from the Hendricks diversion dam to the DeSabla powerhouse to prevent water loss and retain this cold water for lower Butte Creek.

*Our Analysis*

WUA versus flow relationships were developed for the lower West Branch Feather River and are presented in figures 3-33 through 3-35. The reach of lower West

Branch Feather River downstream of Hendricks diversion dam was segmented into three project-affected sub-reaches, including: 1) the non-project Miocene diversion to Fall Creek (RM 15.0 to 21.4); 2) Fall Creek to Big Kimshew Creek (RM 21.4 to 23.2); and 3) Big Kimshew Creek to the Hendricks diversion dam (RM 23.2 to 29.2). Generally, WUA for all three sub-reaches for adult rainbow trout is maximized at higher modeled discharges (between 135 and 190 cfs; figures 3-33 through 3-35). This is likely due to the increasing floodplain/margin habitat that becomes available as discharge increases. WUA for all three sub-reaches for rainbow trout fry is maximized at the lower modeled discharges between 10 and 25 cfs and decreases with increasing discharge, as fry typically rear in slow, shallow water (figures 3-33 through 3-35). Rainbow trout spawning habitat for all three reaches is maximized at flows between 60 and 105 cfs, while juvenile rainbow trout habitat is maximized between 70 and 120 cfs.

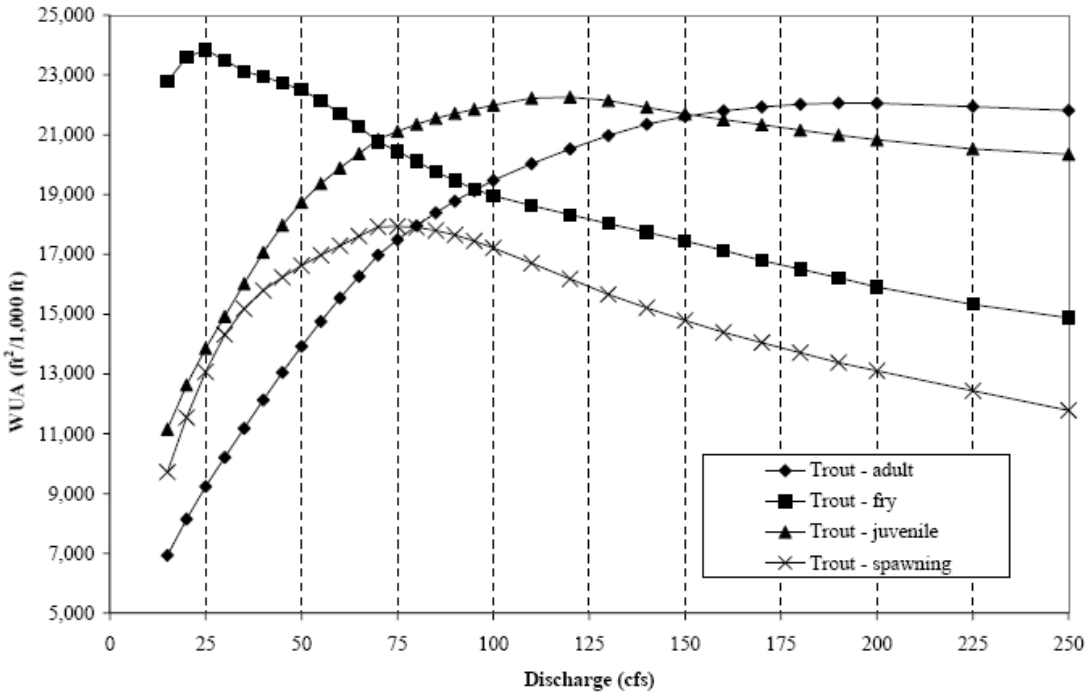


Figure 3-33. Weighted Usable Area (habitat) versus discharge (flow) relationship for spawning, adult, juvenile, and fry life stages of rainbow trout in the lower West Branch Feather River between the non-project Miocene diversion and Fall Creek (RM 15.0 to 21.4). (Source: PG&E, 2007a)

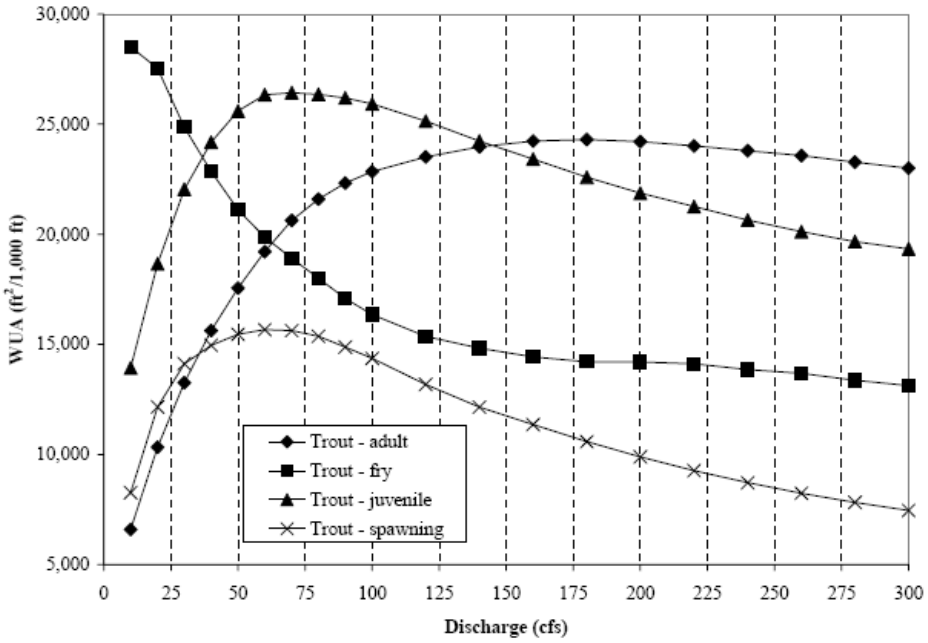


Figure 3-34. Weighted Usable Area (habitat) versus discharge (flow) relationship for spawning, adult, juvenile, and fry life stages of rainbow trout in the lower West Branch Feather River between Fall Creek and Big Kimshew Creek (RM 21.4 to 23.2). (Source: PG&E, 2007a)

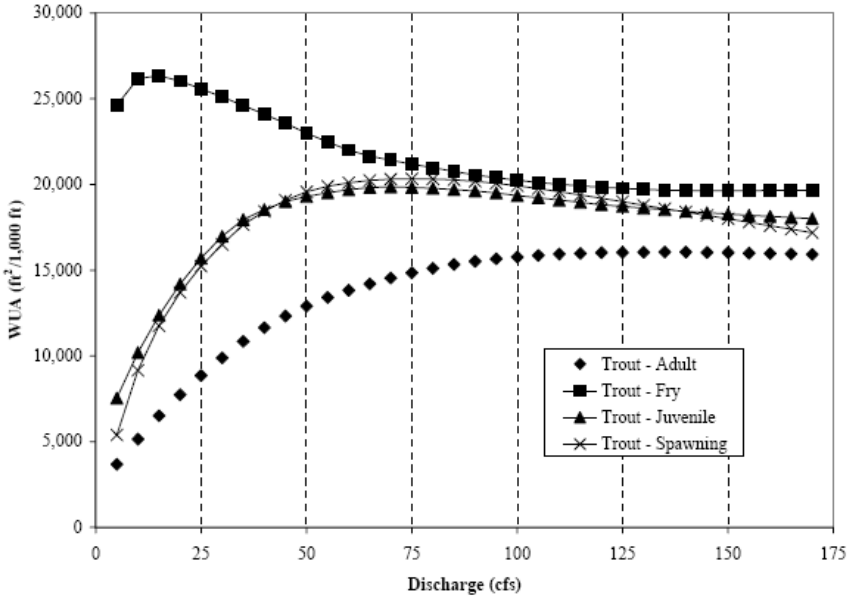


Figure 3-35. Weighted Usable Area (habitat) versus discharge (flow) relationship for spawning, adult, juvenile, and fry life stages of rainbow trout in the lower West Branch Feather River between Big Kimshew Creek and Hendricks diversion dam (RM 23.2 to 29.2). (Source: PG&E, 2007a)

Compared to existing conditions, PG&E's proposed minimum instream flows downstream of the Hendricks diversion dam would provide increased flows during both dry and normal water years, except from June 1 through August 31 in dry water years as shown in table 3-23. In dry years from June 1 through August 31, PG&E's proposed minimum instream flow of 7 cfs would be consistent with existing minimum instream flow requirements in this reach and would continue to maintain the current habitat conditions downstream of Hendricks diversion dam. Outside of June 1 through August 31, PG&E's proposal would provide additional adult rainbow trout, juvenile rainbow trout, and spawning rainbow trout habitat, as further described below and as shown in table 3-24. Further, PG&E's proposed minimum instream flows of between 7 to 30 cfs in normal and dry water years would likely provide excellent habitat for trout fry as the WUA for rainbow trout fry is maximized at flows ranging from 10 to 25 cfs.

Table 3-24. Percent WUA for a given flow (shown in parentheses) in the lower West Branch Feather River. (Source: Forest Service, 2008)

| **Trout Habitat in the Above Big Kimshew Creek Subreach (RMs 29.2-23.2): % WUA at (flow, cfs)** | | | | | |
|---|---|---|---|---|---|
| Adult | 100 (140) | 80 (50) | 62 (30) | 48 (20) | 41 (15) |
| Fry | 94 (5) | 99 (10) | 100 (15) | 99 (50) | 95 (75) |
| Juvenile | 100 (70) | 97 (50) | 86 (30) | 71 (20) | 62 (15) |
| Spawning | 100 (75) | 90 (40) | 81 (30) | 67 (20) | 58 (15) |
| **Trout Habitat in the Big Kimshew to Fall Creek Subreach (RMs 23.2-21.4): % WUA at (flow, cfs)** | | | | | |
| Adult | 100 (180) | 72.2 (50) | 54.5 (30) | 42.5 (20) | 34.8 (15) |
| Fry | 100 (10) | 96.5 (20) | 80.1 (40) | 69.7 (60) | 66.3 (70) |
| Juvenile | 100 (70) | 96.9 (50) | 83.4 (30) | 70.6 (20) | 61.7 (15) |
| Spawning | 100 (60) | 90.1 (30) | 80.1 (22) | 65.2 (15) | 52.8 (10) |
| **Trout Habitat in the Below Fall Creek Subreach (RMs 21.4-15.0): % WUA at (flow, cfs)** | | | | | |
| Adult | 100 (190) | 63.1 (50) | 46.3(30) | 36.9 (20) | 31.4 (15) |
| Fry | 95.6 (15) | 99.0 (20) | 100 (25) | 96.3 (40) | 94.4 (50) |
| Juvenile | 100 (120) | 84.2 (50) | 61.7 (30) | 56.8 (20) | 50.1 (15) |
| Spawning | 100 (75) | 96.4 (60) | 79.8 (30) | 64.4 (20) | 54.2 (15) |

The Forest Service requirement in modified 4(e) condition 18.1, and Cal Fish & Game and FWS recommendations for minimum instream flows downstream of

Hendricks diversion dam are consistent with PG&E's proposal, except during the June 1 to August 31 period in dry years when minimum instream flows would be increased to 15 cfs, compared to PG&E's proposal of 7 cfs, and in normal water years when minimum instream flows would be increased to 30 cfs, compared to PG&E's proposal of 20 cfs. In the sub-reach upstream of Big Kimshew Creek, the Forest Service specified and agency recommended minimum instream flow of 30 cfs in a normal year would provide 62 percent WUA for adult trout habitat, 86 percent WUA for juvenile trout habitat, and 81 percent WUA for spawning trout habitat, compared to PG&E's proposed minimum instream flow of 20 cfs which would provide 48 percent WUA for adult trout habitat, 71 percent WUA for juvenile trout habitat, and 67 percent WUA for spawning trout habitat (table 3-24). The Forest Service's required and Cal Fish & Game, FWS, and Conservation Groups recommended dry year proposal of 15 cfs provides 41 percent WUA for adult trout habitat, 62 percent WUA for juvenile trout habitat, and 58 percent WUA for spawning trout habitat. PG&E's dry year proposal of 7 cfs would provide 27 percent WUA for adult trout habitat and 43 percent WUA for juvenile trout habitat in this sub-reach. The remaining two sub-reaches were not modeled below 10 to 15 cfs.

PG&E conducted a variety of simulation runs for minimum flow scenarios for the lower West Branch Feather River using SNTEMP models to compare the resulting effects on downstream water temperatures.[41] Simulations were produced for flows between 7 and 50 cfs, at semi-monthly intervals during the summer period of late-June through September 15. Figures 3-36 and 3-37 are two examples of these simulations using a normal (2005) and dry year (2007), which compare the various minimum instream flow proposals, requirements, and recommendations for the lower West Branch Feather River and illustrate the subsequent downstream cooling effects these different minimum instream flows yield. Figure 3-36 indicates that in a normal water year under PG&E's proposed minimum instream flow of 20 cfs, water temperatures in July would be reduced downstream of the Hendricks diversion dam compared to existing conditions with a minimum instream flow of 15 cfs. This figure also indicates that in normal water years, water temperatures would only be slightly further reduced under the agency required or recommended minimum instream flow of 30 cfs. However, this figure also shows that the majority of cooling from increasing minimum instream flow releases by 10 cfs occurs within the first 4 miles downstream of Hendricks diversion dam. Downstream of RM 25, the 10 cfs difference in minimum instream flows between PG&E's proposal and agency requirements or recommendations, has minimal effects on reducing water temperatures, likely as a result of tributary inflow and equilibrium conditions being reached between air and water temperatures.

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[41] Additional SNTEMP temperature model results are provided in the license application (PG&E, 2007a) and in PG&E alternative 4(e) conditions (PG&E, 2008c).

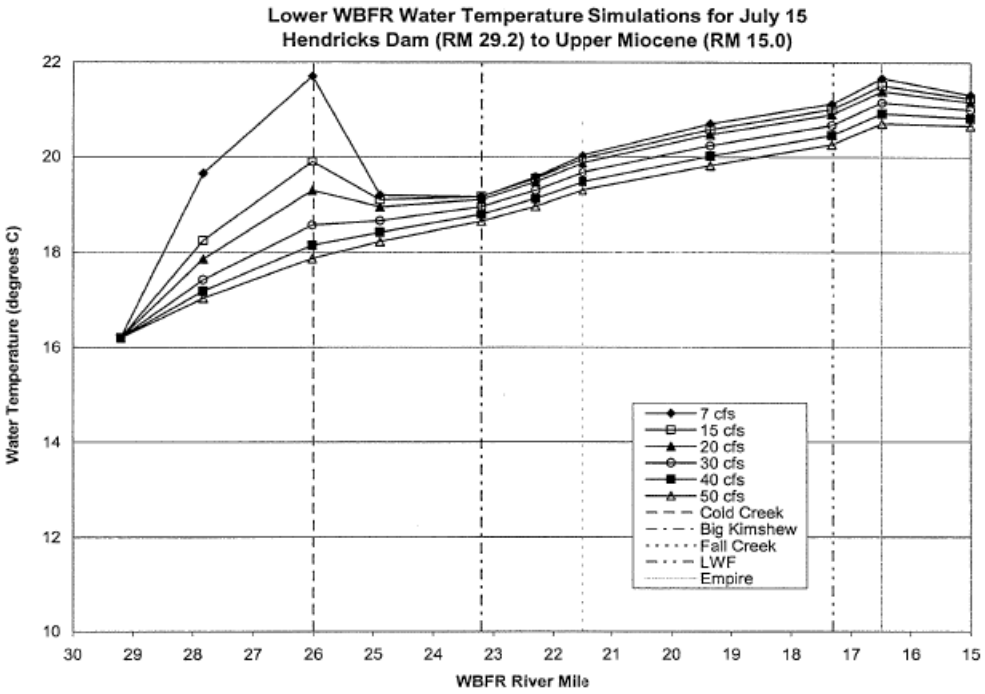


Figure 3-36. Mean daily water temperature simulation results (from SNTEMP) for the West Branch Feather River below Hendricks diversion dam using 2005 hydrology (above normal) and meteorology (hot). (Source: PG&E, 2008c)

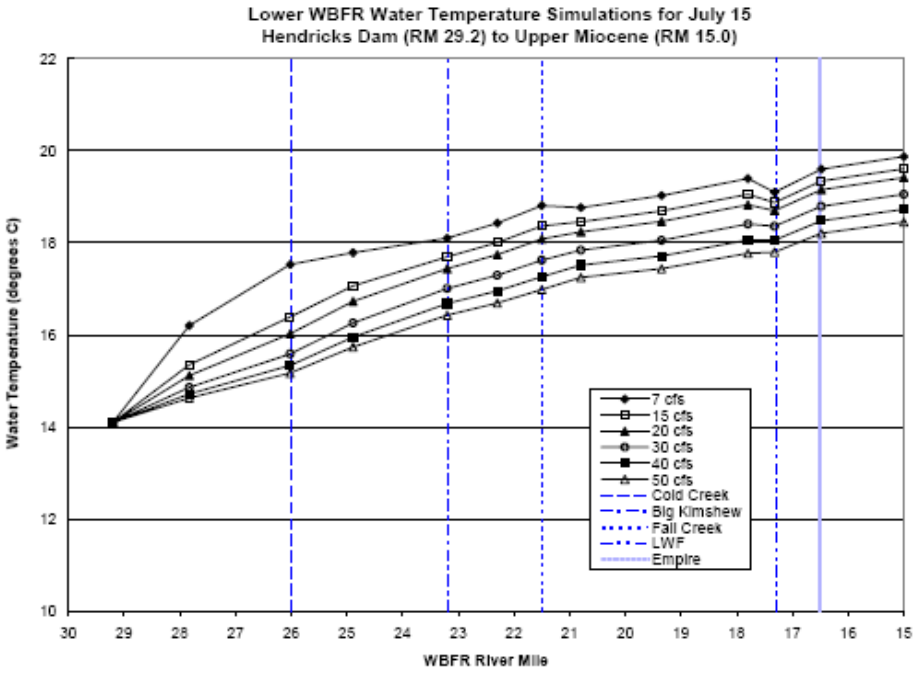


Figure 3-37. Mean daily water temperature simulation results (from SNTEMP) for the West Branch Feather River below Hendricks diversion dam using 2007 hydrology (dry year). (Source: PG&E, 2008c)

Figure 3-37 shows that, in a dry water year, PG&E's proposed minimum instream flow of 7 cfs (June 1 through August 31) would result in downstream water temperatures that are approximately 1°C warmer than those that would occur under the Forest Service specified and agency recommended minimum instream flow of 15 cfs for the first 5 miles downstream of Hendricks diversion dam. However, similar to conditions that would occur under normal water year minimum instream flows, tributary inflow appears to minimize the effects of increased minimum instream flows from Hendricks diversion dam downstream of approximately RM 23 in the lower West Branch Feather River.

For rainbow trout, the literature suggests that maximum growth rates occur at water temperatures less than 17ºC, with preferred temperatures occurring between 13º to 20ºC (Moyle and Marchetti, 1992). Upper incipient lethal water temperatures for rainbow trout were generally about 25ºC. As shown in figure 3-36, both PG&E's proposed minimum instream flow (20 cfs) in normal water years and Forest Service specified and agency recommended minimum instream flow (30 cfs) in normal water years would result in water temperatures within the preferred range for rainbow trout upstream of approximately RM 21 in the lower West Branch Feather River. However, as previously discussed, a 10 cfs increase in minimum instream flows during normal water years has relatively little effect on maintaining water temperatures below 20 ºC downstream of RM 21. Similarly, in dry water years both PG&E's proposed minimum instream flow (7 cfs) and the minimum instream flow specified or recommended by the agencies (15 cfs) would result in downstream water temperatures in the preferred range for rainbow trout downstream to the non- project Miocene diversion. Figures 3-36 and 3-37 also indicate that under all flow scenarios in both normal and dry water years, water temperatures are well below the rainbow trout lethal temperature of 25ºC.

As a result of existing and proposed project operations, releasing additional flows downstream of Hendricks diversion dam would result in less flow being available for diversion through Hendricks canal to lower Butte Creek. Therefore, providing additional minimum instream flows to improve rainbow trout habitat in lower West Branch Feather River, water temperatures could in turn be increased in lower Butte Creek, especially during the hottest times of years (June through August) when PG&E is proposing and the agencies are requiring or recommending increased flows for rainbow trout in the lower West Branch Feather River.

PG&E conducted water temperature simulations to evaluate the effect of increased minimum instream flows downstream of the Hendricks diversion dam and the resulting effects on temperatures in lower Butte Creek in both normal and dry water years (appendix B; tables 1 and 2). Three temperature metrics were evaluated, including: change in mean temperature across the simulation period; the largest change in daily maximum temperature (combined with the date of this change); and the change in the weekly mean of the daily maximum temperature (WMMT) during the hottest part of the summer (i.e., a heat storm event). The mean change in temperature is useful in

characterizing long-term thermal exposure, the largest change in daily maximum gives insight into single events that could cause acute thermal stress related mortality, and WMMT is intended to characterize a significant heat storm event of sufficient duration to be a major mortality factor. For analysis purposes we utilize the WMMT metric because of the insight it provides into an extreme heat event, a condition known to have negative effects on spring-run Chinook salmon in lower Butte Creek and a condition upon which the project is operated via adaptive management to minimize these effects.[42]

As discussed below in the *DeSabla Forebay* section, PG&E proposes, and the Forest Service, Cal Fish & Game, FWS, and NMFS are recommending, that a pipe to transport water from Butte canal, through DeSabla forebay, to the intake for the DeSabla powerhouse be constructed and operated. It was determined this option would be the best alternative to assist in minimizing the amount of thermal loading that occurs within the forebay. Prior to constructing and operating this temperature reduction device, it is unknown how much thermal loading would be reduced, compared to current conditions. However, as discussed during the April 13, 2009, section 10(j) meeting because this was deemed the most efficient method to reduce thermal loading based upon the temperature modeling, for purposes of analysis, we approximate there would be an 80 percent reduction in thermal loading, or the best case scenario presented in PG&E's temperature modeling (see appendix B; tables 1 and 2).

Assuming an 80 percent reduction in thermal loading within the forebay, PG&E's temperature modeling indicates that in normal water years with hot meteorology, removing 5 cfs from the Hendricks canal to supply PG&E's proposed minimum instream flow of 20 cfs to lower West Branch Feather River would decrease the WMMT in lower Butte Creek below the Centerville powerhouse by 0.37°C with the WMMT above the Centerville powerhouse decreasing by approximately 0.44°C (appendix B; table 1). However, assuming an 80 percent reduction in thermal loading and removing 15 cfs at Hendricks canal to provide a minimum instream flow of 30 cfs as specified by the Forest Service and recommended by the agencies to lower West Branch Feather River would decrease the WMMT in lower Butte Creek by 0.13°C, with the WMMT above the powerhouse decreasing by approximately 0.39°C (appendix B; table 1). PG&E's temperature modeling also indicates that by the time water in Butte Creek reaches Helltown, water temperatures are only 0.03 °C colder based on PG&E's proposed minimum instream flows to lower West Branch Feather River. Mean water temperature differences are approximately 0.12°C, 0.03°C, and 0.03°C colder in Butte Creek below Centerville powerhouse, above Centerville powerhouse, and at Helltown, respectively, based on PG&E's proposed minimum instream flows in lower West Branch Feather

[42] All three metrics are provided in appendix B (tables 1 and 2) to provide a more complete assessment of the model output and water temperatures in project-affected reaches.

River, compared to the agency recommended minimum instream flows at the three locations monitored in lower Butte Creek in normal years (appendix B; table 1). Maintaining current minimum instream flow releases and reducing thermal loading by 80 percent results in even further reductions in water temperatures within Lower Butte Creek. In a normal water year, releasing 15 cfs into Lower West Branch Feather River would yield reductions in water temperature of 0.60°C, 0.52°C, and 0.58°C in Lower Butte Creek below Centerville powerhouse, above Centerville powerhouse, and at Helltown, respectively (appendix B; table 1).

During dry years, PG&E proposes to maintain a minimum instream flow of 7 cfs; which coupled with an 80 percent reduction in thermal loading would result in water temperature reductions of 0.36°C, 0.38°C, and 0.77°C in Lower Butte Creek below Centerville powerhouse, above Centerville powerhouse, and at Helltown, respectively (appendix B; table 2). However, again, the Forest Service condition and recommendations from FWS, Cal Fish & Game, and the Conservation Groups would increase this minimum instream flow in lower West Branch Feather River to 15 cfs. As a result, temperature modeling by PG&E indicates that based on an 80 percent reduction in thermal loading within the forebay, providing this 15 cfs minimum instream flow would result in a 0.15°C decrease in the WMMT downstream of the Centerville powerhouse, a 0.33 decrease in the WMMT upstream of Centerville powerhouse, and 0.72°C decrease in the WMMT downstream of the Centerville powerhouse (appendix B; table 2). Compared to current conditions, mean water temperature differences would be approximately 0.32°C, 0.27°C, and 0.30°C colder in Butte Creek below Centerville powerhouse, above Centerville powerhouse, and at Helltown, respectively, based on the agency recommended minimum instream flows in lower West Branch Feather River during dry years (appendix B; table 2).

Overall, taking into consideration an 80 percent reduction in thermal loading within the DeSabla forebay, PG&E's temperature modeling indicates there would be little difference in water temperatures (WMMT or mean temperature differences) in lower Butte Creek as a result of releasing PG&E's proposed or agency recommended minimum instream flows downstream of Hendricks diversion dam between June and July. Although PG&E's proposed minimum instream flows for lower West Branch Feather River are less than those recommended by the agencies, there is a negligible further reduction in lower Butte Creek water temperatures, as discussed above, as a result of diverting this additional water from the West Branch Feather River drainage. We further discuss the affects of a DeSabla forebay temperature reduction device on water temperatures within lower Butte Creek below in the *DeSabla Forebay* section; however, this temperature modeling indicates reducing thermal loading by 80 percent would likely minimize any additional heating that would occur in lower Butte Creek as a result of releasing the agency proposed minimum instream flows to the West Branch Feather River downstream of Hendricks diversion dam.

Extracting water from Hendricks canal to provide increased minimum instream flows downstream of Hendricks diversion dam result in reduced quantities of water available for diversion to the Butte Creek watershed. Absent a water temperature reduction device in DeSabla forebay, PG&E's temperature modeling indicates this may result in increased water temperatures in lower Butte Creek. As shown in appendix B, table 1, simulation no. 4 illustrates the water temperature warming that would occur in lower Butte Creek as a result of releasing PG&E's proposed minimum instream flow of 20 cfs between June through August in normal years. Temperature modeling indicates the WMMT in Butte Creek at Helltown, above Centerville powerhouse, and below Centerville powerhouse would warm 0.03°C, 0.03°C, and 0.12°C, respectively, as a result of implementing PG&E's proposed minimum instream flows, without a DeSabla forebay temperature improvement facility. Similarly, simulation no. 5 in Appendix B, table 1, indicates water temperatures would experience additional warming in lower Butte Creek upon implementing the agency recommended minimum instream flow of 30 cfs between June through August in normal years with the WMMT at Helltown, above Centerville powerhouse, and below Centerville powerhouse warming 0.11°C, 0.12°C, and 0.38°C, respectively. Therefore, the recommendations from Cal Fish & Game and the Conservation Groups to refrain from implementing their recommended minimum instream flows at Hendricks diversion dam until after construction of a temperature reduction device would eliminate any increases in water temperatures in lower Butte Creek as a result of providing these minimum instream flows to lower West Branch Feather River, as previously discussed.

Ensuring that any minimum instream flows released at Hendricks diversion dam be maintained within the West Branch Feather River downstream along the natural stream course to its discharge at the high-water line of Lake Oroville and not diverting flows from the West Branch Feather River through methods under PG&E's control would ensure all aquatic resources in this reach would benefit from minimum instream flows released at Hendricks diversion dam. However, the Miocene diversion dam, located approximately 14 miles downstream of the Hendricks diversion dam, is a non-project structure located outside the project boundary. Because this facility is not subject to the terms and conditions of the license, this recommendation is unenforceable and as a result we do not discuss it further.

The Forest Service and Cal Fish & Game recommendation for PG&E to consult with the Water Board and the resource agencies to identify water rights is a State of California issue. Therefore, we do not further discuss this recommendation further.

CSSA's recommendation to pipe flows from Hendricks diversion dam to DeSabla powerhouse would likely reduce thermal loading and water loss compared to existing and proposed project operations which utilize a series of canals, tunnels, and a forebay to divert water to lower Butte Creek. However, the feasibility of using a pipe to divert

flows to DeSabla powerhouse is unknown, without first conducting a thorough engineering analysis. Further, installing such a pipeline would likely be cost prohibitive.

We discuss the cost of developing and implementing this measure and present our final recommendations in section 5, *Conclusions and Recommendations*.

*Upper Butte Creek-Downstream of Butte Creek diversion dam*

The existing license requires that PG&E release on a year-round basis, 16 cfs downstream of Butte Creek diversion dam during normal water years and 7 cfs during dry water years. PG&E proposes to release the minimum instream flows shown in table 3-25 downstream of the Butte Creek diversion dam in upper Butte Creek. Table 3-25 also shows minimum instream flows recommend by the agencies for this reach, including those contained in: Forest Service modified 10(a) recommendation 2.2, FWS 10(j) recommendation 2.2, and Cal Fish & Game 10(j) recommendation 1.

Table 3-25. Comparison of PG&E's existing and proposed, and agency recommended instream flows for upper Butte Creek downstream of Butte Creek diversion dam. (Source: Staff, 2009)

| | **PG&E's Existing Instream Flow (cfs) by Water Year** | | **PG&E's Proposed Instream Flow (cfs) by Water Year** | | **Agency Instream Flow (cfs) by Water Year Type[a]** | |
|---|---|---|---|---|---|---|
| **Month** | **Normal** | **Dry** | **Normal** | **Dry** | **Normal** | **Dry** |
| September | 16 | 7 | 16 | 7 | 16 | 10 |
| October | 16 | 7 | 16 | 7 | 16 | 10 |
| November | 16 | 7 | 16 | **7** | 16 | 10 |
| December | 16 | 7 | 16 | **7** | 16 | 10 |
| January | 16 | 7 | 16 | **7** | 16 | 10 |
| February | 16 | 7 | 16 | **7** | 16 | 10 |
| March | 16 | 7 | 30 | 20 | 30 | 20 |
| April | 16 | 7 | 30 | 20 | 30 | 20 |
| May | 16 | 7 | 30 | 20 | 30 | 20 |
| June | 16 | 7 | 16 | 7 | 16 | 10 |
| July | 16 | 7 | 16 | 7 | 16 | 10 |
| August | 16 | 7 | 16 | 7 | 16 | 10 |

[a] Agencies include the Forest Service, FWS, and Cal Fish & Game.

CSSA also recommends that the existing minimum instream flow in this reach be increased to improve cold water downstream of the diversion dam to support and maintain cold water species and their habitat during all water year types. CSSA further recommends that during critical dry and drought water years, all water be released downstream of the Butte Creek diversion dam and that no water be diverted at Butte canal to provide cold water for aquatic species downstream of the diversion, including spring-run Chinook salmon in lower Butte Creek.

*Our Analysis*

WUA versus flow relationships were developed for the upper Butte Creek reach downstream of the Butte Creek diversion dam (RM 72 to 61.9) and are presented in figure 3-38. For three of the four trout life-stages (adult, juvenile, and spawning trout habitat), WUA is maximized at discharges between 65 and 100 cfs. However, trout fry habitat is maximized at 15 cfs and continues to decrease with increasing discharge, as fry typically rear in slow, shallow water.

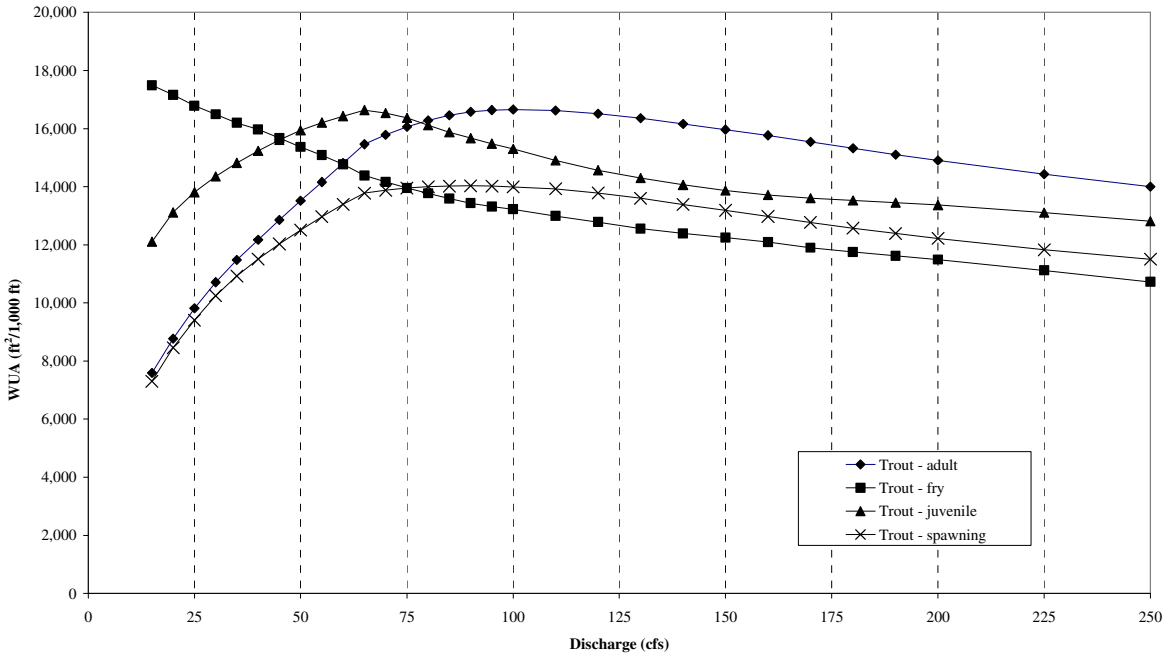


Figure 3-38. Weighted Usable Area (habitat) versus discharge (flow) relationship for spawning, adult, juvenile, and fry life stages of rainbow trout in upper Butte Creek, downstream of the Butte Creek diversion dam. (Source: PG&E, 2007a)

PG&E's proposed minimum instream flows for this reach are consistent with existing license conditions, except PG&E proposes and the agencies recommend an increase in minimum instream flows from March 1 to May 31 in normal years from 16 to 30 cfs, and in dry years from 7 to 20 cfs. In normal water years this increase in minimum

instream flows would provide approximately an additional 18 percent of the WUA for adult trout habitat, 13 percent of the WUA for juvenile trout habitat, and 21 percent of the WUA for trout spawning habitat compared to existing conditions (table 3-26). A minimum instream flow of 30 cfs would provide a WUA for adult trout habitat, fry habitat, juvenile trout habitat, and spawning trout habitat of 64, 94, 86, and 73 percent, respectively (table 3-26). Although this reach was not modeled below 15 cfs, adult trout habitat, juvenile habitat, and spawning trout habitat would also be increased during dry water years by increasing minimum instream flows from 7 to 20 cfs. During dry water years, a minimum instream flow of 20 cfs would provide WUA for adult trout habitat, fry habitat, juvenile trout habitat, and spawning trout habitat of 53, 98, 79, and 60 percent, respectively (see table 3-26).

Table 3-26. Percent Wetted Usable Area for a given flow (shown in parentheses) in upper Butte Creek. (Source: PG&E, 2007a)

| **Trout Lifestage** | **Percent WUA at (flow, cfs)** | | | | |
|---|---|---|---|---|---|
| Adult | 100 (100) | 81 (50) | 64 (30) | 53 (20) | 46 (15) |
| Fry | 100 (15) | 98 (20) | 94 (30) | 88 (50) | 80 (75) |
| Juvenile | 100 (65) | 96 (50) | 86 (30) | 79 (20) | 73 (15) |
| Spawning | 100 (90) | 89 (50) | 73 (30) | 60 (20) | 52 (15) |

Overall, PG&E's minimum instream flow proposals for upper Butte Creek are consistent with recommendations from the Forest Service, FWS, and Cal Fish & Game, except during dry water years from June 1 to February 28/29, as minimum instream flows recommended by the agencies would be increased to 10 cfs, compared to PG&E's proposal of 7 cfs. Although the reach downstream of Butte Creek diversion dam was not modeled below 15 cfs, it is likely that the agency recommended increase in minimum instream flows downstream of this diversion dam would increase adult trout habitat, fry habitat, juvenile trout habitat and trout spawning habitat for trout present in this reach compared to existing conditions. However, the amount of additional habitat that would be provided by implementing a 10 cfs minimum instream flow, compared to a 7 cfs minimum instream flow, is indeterminable.

PG&E conducted a variety of temperature simulation runs for minimum flow scenarios for upper Butte Creek using SNTEMP models.[43] Simulations were produced for flows ranging between 7 and 50 cfs, at semi-monthly intervals during the summer

[43] Additional SNTEMP temperature model results are provided in the license application (PG&E, 2007a).

period of late June through September 15. Figure 3-39 illustrates simulations for peak temperature conditions in upper Butte Creek. As shown in figure 3-39, an increase in minimum instream flows downstream of Butte Creek diversion dam of 3 cfs would reduce temperatures downstream of this diversion in the summer months. This 3 cfs increase in minimum instream flows results in slightly cooler water temperatures compared to conditions that would occur under PG&E's proposal, and the effects of this water temperature reduction appear to be minimized downstream of RM 68, resulting in cooler water temperatures for only 4 to 5 miles immediately downstream of the Butte Creek diversion dam.

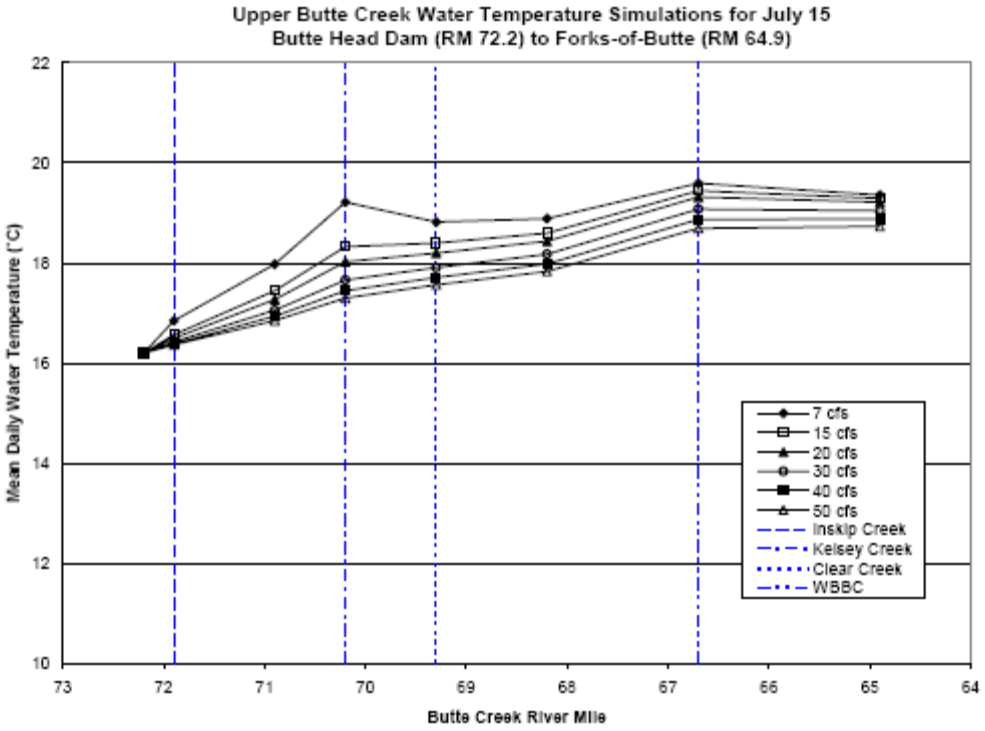


Figure 3-39. July 15 simulation for upper Butte Creek 2005 calibration model. (Source: PG&E, 2008b)

By providing this additional 3 cfs downstream of the Butte Creek diversion dam, less water would be available for diversion into Butte canal during the warmer summer months (June through September). Figure 3-40 demonstrates the increase in thermal loading that occurs in Butte canal as the quantity of water diverted at the diversion dam is reduced and subsequently released as minimum instream flows downstream of Butte Creek diversion dam. As shown in figure 3-40, the greater quantity of water within Butte canal, the less effect extracting 3 cfs from the canal would have on increasing water temperatures within Butte canal. During the April 10, 2009, section 10(j) meeting Cal Fish & Game stated that during the hottest day of the year in 2004, the water within Butte canal heated an additional 0.05°C as a result of extracting this water from the canal.

This modeling indicates that extracting up to 3 cfs from Butte canal during June through September in dry years, as recommended by the agencies, would likely have little effect on warming water temperatures within Butte canal. Also, as further discussed below in the *DeSabla Forebay* section, construction and operation of a DeSabla forebay temperature reduction device (i.e., a pipe), would likely eliminate any minimal potential heating within lower Butte Creek that would be associated with reducing flows within Butte canal (by 3 cfs).

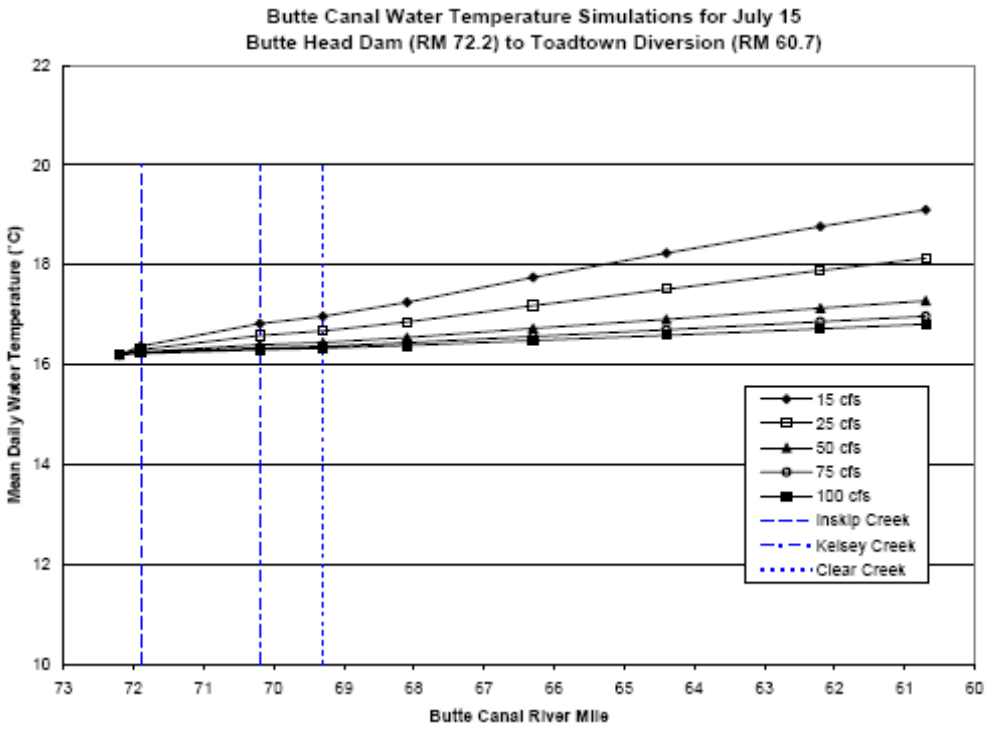


Figure 3-40. July 15 simulation for Butte canal 2005 calibration model. (Source: PG&E, 2008b)

Providing all stream flow downstream of Butte Creek diversion dam, as recommended by CSSA, and not diverting water through Butte canal, would likely provide additional juvenile, adult trout, and spawning trout habitat in this reach. However, absent water temperature and project operations modeling, the effects of allowing all stream flow to remain in this reach on water temperatures in lower Butte Creek are unknown.

*Lower Butte Creek-Downstream of Lower Centerville Diversion Dam*

The existing license requires that PG&E release on a year-round basis, the minimum instream flows shown in table 3-27, downstream of Lower Centerville diversion dam. However, in an effort to increase spawning habitat for spring-run

Chinook salmon from mid-September through February, the annual Project Operations and Maintenance Plan developed by PG&E, in consultation with the agencies, has implemented increased minimum instream flows downstream of Lower Centerville diversion dam based on an adaptive management approach. Typically, the plan has resulted in minimum instream flows ranging from 60 to 75 cfs downstream of the Lower Centerville diversion dam.[44]

PG&E proposes to release the minimum instream flows shown in table 3-27 downstream of Lower Centerville diversion dam in lower Butte Creek. Table 3-27 also shows minimum instream flows recommend by the agencies for this reach, including those contained in: Forest Service modified 10(a) recommendation 2.1, NMFS 10(j) recommendation 2.1, FWS 10(j) recommendation 2.1, and Cal Fish & Game 10(j) recommendation 1.[45] CSSA also recommends that additional daily flows and cold water be provided for spring-run Chinook salmon in this reach.

Table 3-27. Comparison of PG&E's existing and proposed, and agency recommended instream flows for lower Butte Creek downstream of Lower Centerville diversion dam. (Source: Staff)

| **Lower Butte Creek Reach** | **PG&E's Existing Instream Flows (cfs) by Water Year** | | **PG&E's Proposed Instream Flows (cfs) by Water Year[a]** | | **Agency Instream Flows (cfs) by Water Year Type[b]** | |
|---|---|---|---|---|---|---|
| **Month** | **Normal** | **Dry** | **Normal** | **Dry** | **Normal** | **Dry** |
| Sept. 1-14 | 40 | 40 | **40** | **40** | (40) | (40) |
| Sept. 15-30 | 40 | 10 | **75** | **60** | 100 | 75 |
| October | 40 | 10 | **75** | **60** | 100 | 75 |
| November | 30 | 10 | **75** | **60** | 100 | 75 |
| Dec. 1-14 | 30 | 10 | **75** | **60** | 100 | 75 |
| Dec. 15-31 | 40 | 10 | **75** | **60** | 100 | 75 |
| January | 40 | 10 | **75** | **60** | 100 | 75 |

[44] In the 2008 spawning season, all available flow (approximately 65 cfs) at the Lower Centerville diversion dam was released to Butte Creek and no diversions were made at the Lower Centerville Canal.

[45] During the April 13, 2009, 10(j) meeting the agencies stated they propose modifying their preliminary recommendation for minimum instream flows to increase beginning September 1 to September 15, consistent with PG&E's proposal.

| Lower Butte Creek Reach | PG&E's Existing Instream Flows (cfs) by Water Year | | PG&E's Proposed Instream Flows (cfs) by Water Year[a] | | Agency Instream Flows (cfs) by Water Year Type[b] | |
|---|---|---|---|---|---|---|
| February | 40 | 10 | **80** | **75** | 100 | 75 |
| March 1-14 | 40 | 10 | **80** | **75** | 100 | 75 |
| March 15-31 | 40 | 10 | **80** | **75** | 80 | 75 |
| April | 40 | 10 | **80** | **75** | 80 | 75 |
| May | 40 | 10 | **80** | **65** | 80 | 65 |
| June | 40 | 40 | **40** | **40** | 40 | 40 |
| July | 40 | 40 | **40** | **40** | 40 | 40 |
| August | 40 | 40 | **40** | **40** | 40 | 40 |

[a] The Operations and Maintenance Plan implemented in 1999 and updated annually in consultation with the agencies has controlled minimum flow releases downstream of Centerville diversion dam. June through January values are current Operations and Maintenance Plan flow targets for Lower Centerville diversion dam during normal and dry water years. February through May values are proposed minimum instream flow requirements for lower Centerville diversion dam to address steelhead spawning during normal and dry water years.

[b] Agencies include the Forest Service, FWS, NMFS, and Cal Fish & Game.

*Our Analysis*

As table 3-27 shows, PG&E's proposed minimum instream flows downstream of Lower Centerville diversion dam are consistent with those recommended by NMFS, Cal Fish & Game, and the FWS, except from September 15 through March 14 in normal water year types, and September 15 through January 31 in dry water year types. During the April 13, 2009, section 10(j) meeting and in comments received on the draft EA, the agencies stated their primary concern with the Lower Butte Creek reach is the amount of available spawning habitat for spring-run Chinook salmon downstream of Lower Centerville diversion dam. The agencies further stated that under current conditions, there is a large amount of redd superimposition in this reach, which would be greatly reduced, along with pre-emergent fry morality, if the agency recommended flows were implemented (see table 3-27). Lastly, the agencies stated that releasing their recommended flows from Lower Centerville diversion dam would provide more spawning habitat both upstream and downstream of Centerville powerhouse, allowing salmonids to spread out and better utilize the habitat made available upon implementation of their recommended minimum instream flows.

Estimates indicate that at minimum instream flows of 40, 60, 70, and 130 cfs (no water diverted at Lower Centerville canal) downstream of Lower Centerville diversion dam, the available spawning habitat upstream of Centerville powerhouse would support between 152 to 1,316, 180 to 1,566, 216 to 1,870, and 270 to 2,352 spawning spring-run Chinook salmon, respectively (NMFS, 2006). Similarly, PG&E states that its proposed minimum instream flow of 75 cfs from September 15 through January 31 would support between 228 and 1,992 spawning salmon, while the agency recommended 100 cfs minimum instream flow would support between 242 to 2,093 spawning salmon (PG&E, 2008b). Based on a 7 year period (2001 through 2007) between 6,547 and 12,608 Chinook salmon attempted to spawn in this reach on an annual basis (PG&E, 2008b). This data indicates that the available spawning habitat upstream of Centerville powerhouse has been consistently over utilized in recent years, likely resulting in redd superimposition, and egg and pre-emergent fry mortality. Although increased minimum instream flows from the Lower Centerville diversion dam would likely increase spawning habitat, as discussed below, it is likely that providing all flow downstream of the Lower Centerville diversion dam would still not provide a sufficient amount of spawning habitat to accommodate the number of salmon that have returned to spawn in recent years. Consistent with conclusions made by NMFS in the preliminary biological opinion, it appears that the spring-run Chinook salmon population in Butte Creek has reached or exceeded its carrying capacity (NMFS, 2006).

To assess the relationship between WUA and stream flow, flow relationships were developed for the middle Butte and lower Butte sub-reaches; the results are shown in figures 3-41 and 3-42, respectively). The lower Butte sub-reach extended from the Honey Run Covered Bridge to Centerville powerhouse (RM 49.6 to 55.2) and the middle Butte sub-reach extended from Centerville powerhouse to Lower Centerville diversion dam (RM 55.2 to 61.8).

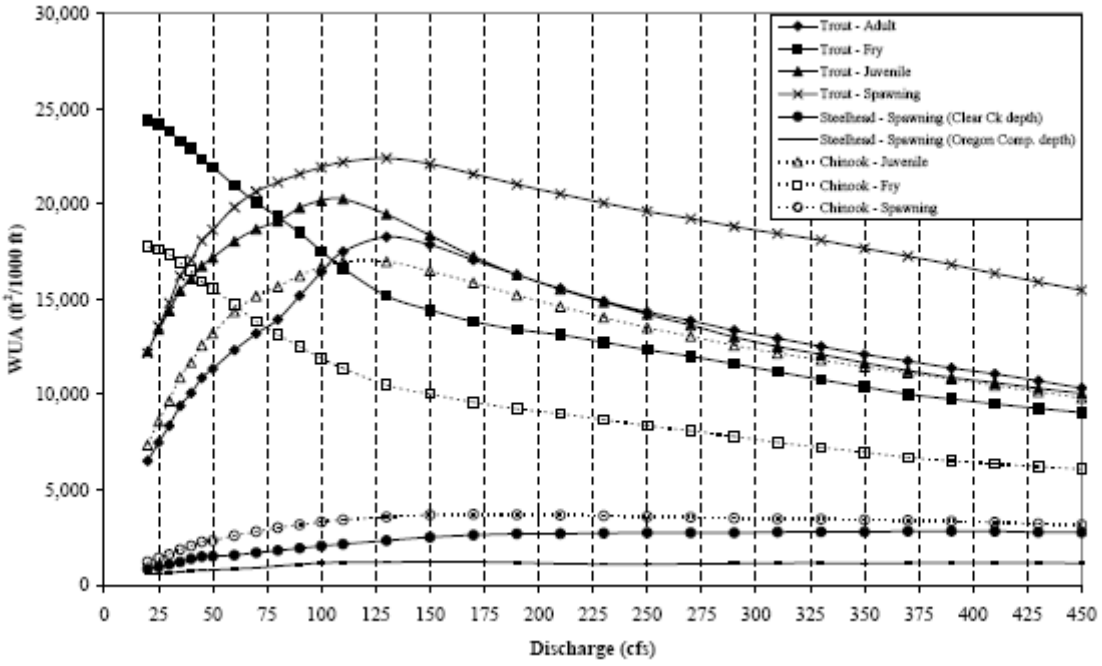


Figure 3-41. Weighted Usable Area (habitat) versus discharge (flow) relationship for nine species/life stages in the middle Butte Creek sub-reach of the lower Butte Study Area. (Source: PG&E, 2008b).

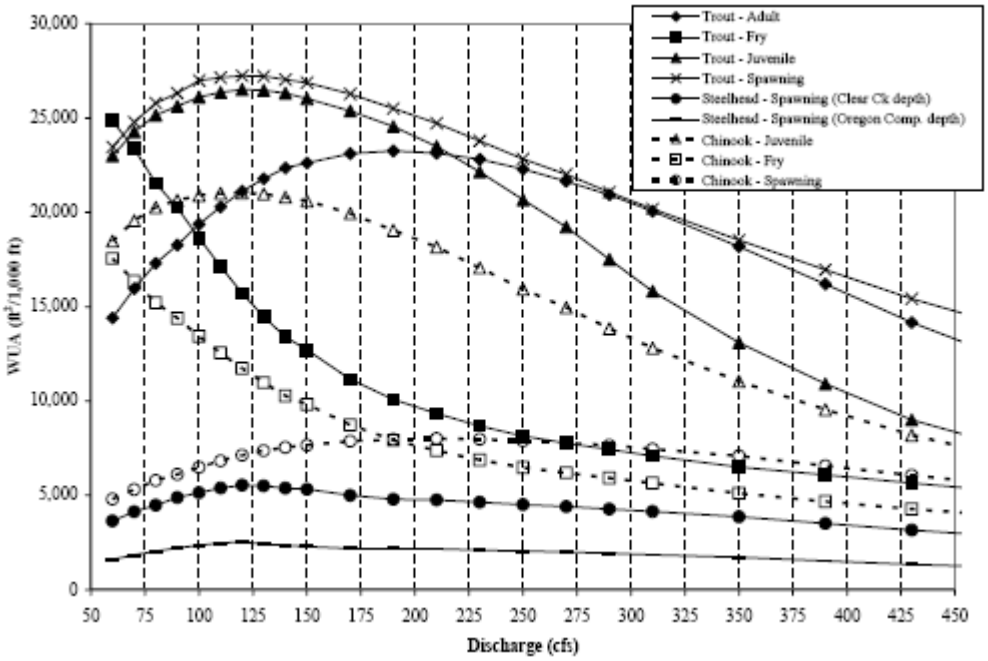


Figure 3-42. Weighted Usable Area (habitat) versus discharge (flow) relationship for nine species/life stages in the lower Butte Creek sub-reach of the lower Butte Study Area. (Source: PG&E, 2008b)

In the middle Butte sub-reach, trout (and Chinook salmon) fry habitat continues to increase with decreasing discharge, as fry typically rear in slow, shallow water (see figure 3-41). Steelhead spawning WUA begins to flatten after 100 cfs (e.g., a 25 cfs increase in discharge result in very little increase in WUA, though it is maximized at 310 cfs using Clear Creek depth criteria and 100 cfs using Oregon composite depth criteria). Habitat for juvenile Chinook salmon peaks at about 110 cfs, while spawning habitat peaks at 170 cfs (see figure 3-41). Figure 3-43 shows the habitat-discharge relationship for spawning Chinook estimated using FWS' 2D model of only selected spawning areas (not a reach-wide assessment) above the Centerville powerhouse wherein maximum WUA continues to increase after 400 cfs but the rate of increase is very slow after 150 cfs (e.g., most of the WUA occurs at 150 cfs) (PG&E, 2008b).

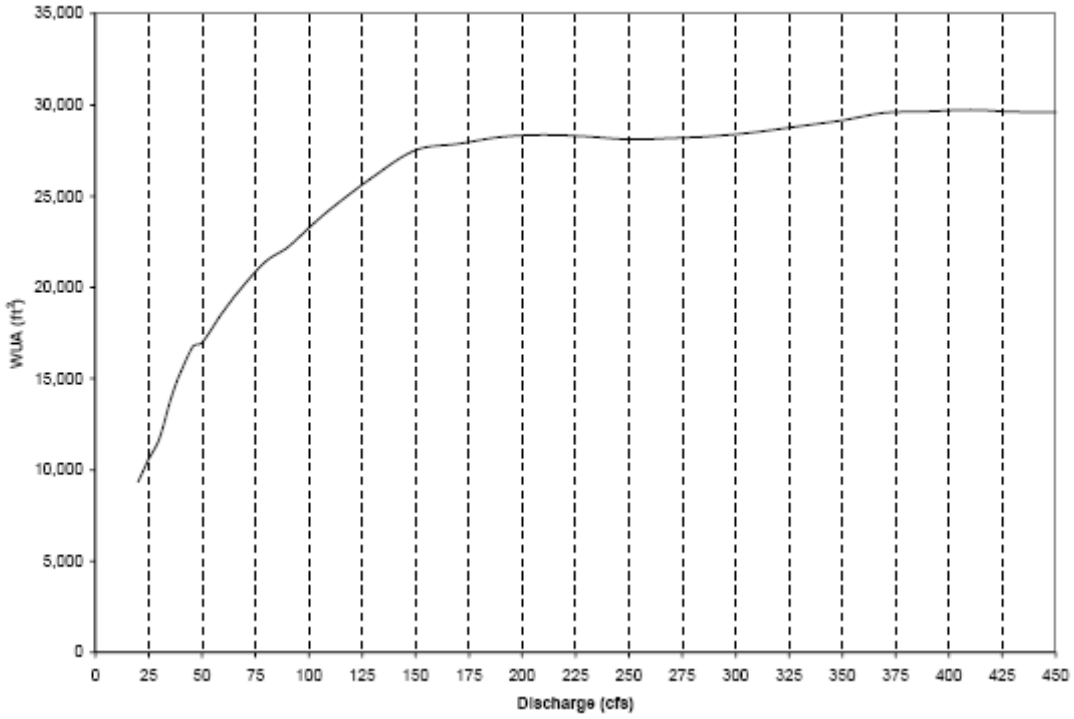


Figure 3-43. Weighted Usable Area (habitat) versus discharge (flow) relationship for spring-run Chinook salmon spawning in selected spawning areas in the middle Butte sub-reach of the lower Butte Study Area using FWS 2D modeling data (figure 9, Gard 2003). (Source: PG&E, 2008b)

In the middle Butte Creek reach, PG&E's proposed minimum instream flow in a normal year (75 cfs) would provide 68 percent of the WUA for spring-run Chinook salmon spawning, compared to the agency recommended minimum instream flow (100 cfs) which would provide 78 percent of the WUA for spring-run Chinook salmon spawning. The agency recommended minimum instream flow of 100 cfs would provide approximately 8 to 10 percent more WUA for spring-run Chinook salmon spawning

based upon PG&E's proposed minimum instream flows of 75 and 80 in normal water years. In dry water years, PG&E's proposed minimum instream flow of 60 and 75 cfs would provide 62 and 68 percent, respectively, of the WUA for spring-run Chinook salmon spawning. The agency recommended minimum instream flow in dry water years (75 cfs) would provide 68 percent of the WUA, or a 6 percent increase in WUA for spring-run Chinook salmon spawning from September 15 through January 31 based upon PG&E's proposed minimum instream flow of 60 cfs.

In the lower Butte sub-reach, trout (and Chinook salmon) fry habitat decreases with increasing discharge, as fry typically rear in slow, shallow water (see figure 3-42). Steelhead spawning WUA begins to flatten after 125 to 150 cfs, depending upon whether Clear Creek or Oregon Composite depth criteria are used. Chinook salmon juvenile life stage WUA peaks at approximately 100 cfs, while spawning habitat continues to increase after 150 cfs, but at a very slow rate through 175 cfs (figure 3-42). Figure 3-44 shows the habitat-discharge relationship for spawning Chinook estimated using FWS' 2D model of only selected spawning areas (not a reach-wide assessment) below the Centerville powerhouse wherein maximum WUA occurs at approximately 190 cfs.

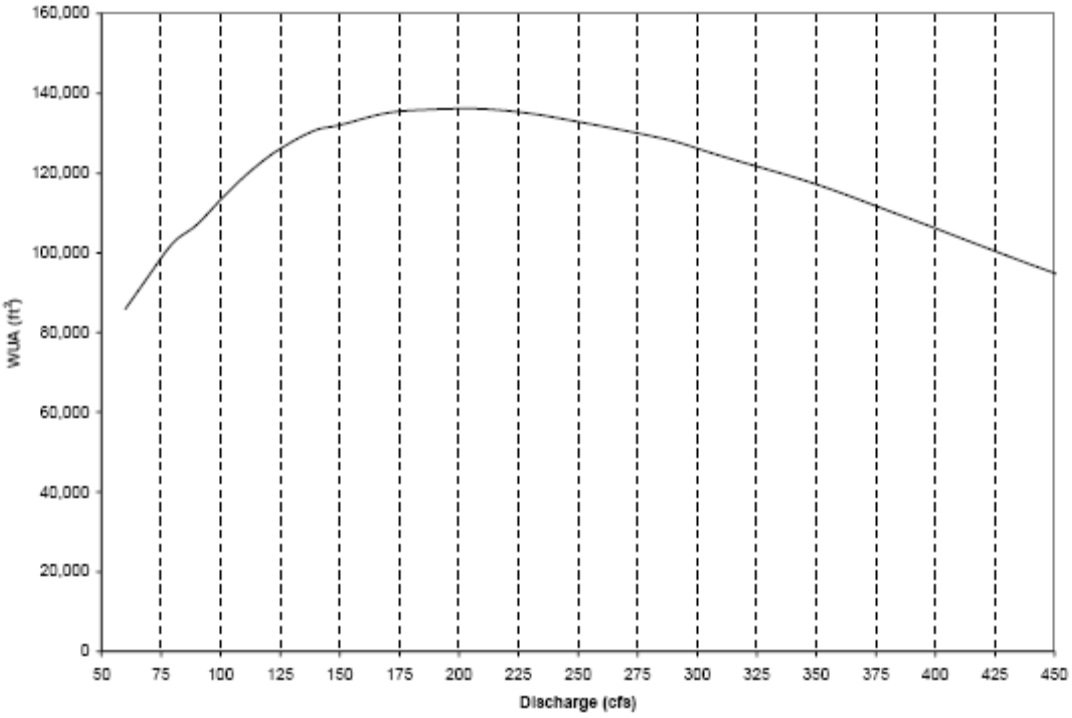


Figure 3-44. Weighted Usable Area (habitat) versus discharge (flow) relationship for spring-run Chinook salmon spawning in selected spawning areas in the lower Butte sub-reach of the lower Butte Study Area using FWS 2D modeling data. (Source: PG&E, 2008b)

In the lower Butte sub-reach, the Forest Service, FWS, NMFS, and Cal Fish & Game recommend a minimum instream flow of 100 cfs be released after the onset of spring-run Chinook spawning activity. This 100 cfs would provide 86 percent of the maximum WUA for spring-run Chinook spawning habitat, compared to the 74 percent of the maximum WUA that would be provided with PG&E's proposed minimum instream flow of 75 cfs. In normal water years, the agency recommended minimum instream flow of 100 cfs would provide an additional 8 to 12 percent WUA for spring-run Chinook salmon spawning habitat in the lower Butte Creek sub-reach based on flows of 75 and 80 cfs, respectively, as PG&E proposed. In dry water years, agency required or recommended minimum instream flow of 75 cfs would provide 74 percent of maximum WUA for spring-run Chinook salmon spawning compared to PG&E's proposal of 60 cfs which would provide 65 percent of maximum WUA for spring-run Chinook spawning.

Overall, the agency recommended minimum instream flows would provide approximately an additional 6 to 10 percent WUA for spring-run Chinook salmon spawning habitat in the middle Butte Creek sub-reach, and an additional 8 to 12 percent WUA for salmon spawning habitat in the lower Butte sub-reach compared to PG&E's proposal. Providing this additional spawning habitat under the agency recommended minimum instream flows may help to alleviate redd superimposition by spring-run Chinook salmon in lower Butte Creek. Providing these additional flows may also contribute to the problem of redd superimposition by providing greater attraction flows for spawning salmon, which may lead to overcrowding and overutilization of any additional spawning habitat created as a result of increasing minimum instream flows downstream of Lower Centerville diversion dam. However, during the section 10(j) meeting Cal Fish & Game and FWS stated that during the past few years, as flows have been increased downstream of Lower Centerville diversion dam during the spring-run Chinook salmon spawning period as a result of implementing the annual Operations and Maintenance Plan, there has not been any evidence to suggest higher flows in the fall have reduced the downstream redistribution of salmon.

Generally, it can be expected that improvements to Chinook salmon habitat conditions are also beneficial to steelhead. Therefore, because most steelhead spawning takes place in the middle Butte Creek sub-reach from December through March, PG&E's proposed minimum instream flow of 75 to 80 in normal years, and 60 to 75 cfs in dry water years during December through April would provide additional spawning habitat for steelhead compared to existing conditions. However, as previously discussed, the agency recommended minimum instream flows would provide greater flows, and therefore additional spawning habitat for this federally listed species compared to PG&E's proposal.

As further discussed below, water temperatures associated with minimum instream flow releases from Lower Centerville diversion dam also play an integral role in providing suitable habitat conditions for spring-run Chinook salmon. However, water

temperatures are most important during the warmer summer months (June through mid-September) when salmon are holding in Lower Butte Creek. As shown in table 3-27, PG&E proposal for minimum instream flows during the summer months in normal and dry water years are consistent with those recommended by the agencies. As further discussed below, PG&E proposes and the agencies recommend that project operations be managed during this time of year according to an annual Project Operations and Maintenance Plan, which would adaptively manage project operations and releases from Lower Centerville diversion dam in an effort to provide cold water for holding spring-run Chinook salmon. Therefore, it is unlikely the differences in PG&E's proposed flows, and those recommended by the agencies, would result have any affect on water temperatures during the spawning period of spring-run Chinook salmon in Lower Butte Creek, as these increased flows would not be implemented until mid-September.

*Butte Creek Feeder Creeks-Inskip, Kelsey, Clear, and Helltown Ravine Creeks*

PG&E proposes: (1) to release a minimum instream flow of 0.25 cfs, or inflow, during normal water years, and 0.1 cfs, or inflow, during dry water years, on a year-round basis downstream of the diversions on Inskip and Kelsey creeks; (2) to release a minimum instream flow of 0.5 cfs, or inflow, during normal water years, and 0.25 cfs, or inflow, during dry water years, on a year-round basis downstream of the diversion dam on Clear Creek; and (3) no minimum instream flow for Helltown Ravine. PG&E states that Helltown Ravine is an intermittent stream whose current flow is present only because of unused water (i.e., return flow) that is coming from the Upper Centerville canal and that a minimum instream flow is therefore unwarranted (PG&E, 2008). PG&E's proposals are consistent with minimum instream flows under the existing license as shown in table 3-3.

FWS in 10(j) recommendation 2.6 and Forest Service in modified 10(a) recommendation 2.6 recommend that until the time that natural flows upstream of the diversions on Inskip, Kelsey, Clear, and Helltown Ravine creeks decrease to 1 cfs, PG&E shall release a bypass flow of 1 cfs, or inflow, during normal water years and 0.5 cfs, or inflow, during dry water years. FWS and the Forest Service further recommend that once natural flows upstream of the Helltown Ravine diversion reach 1 cfs, PG&E shall stop diverting water.

The Conservation Groups recommend that if the Commission does not adopt the Conservation Groups' proposed preferred alternative, then PG&E shall provide a minimum bypass flow of 1 cfs in Helltown Ravine downstream of Lower Centerville canal to benefit a known population of foothill yellow-legged frogs.

*Our Analysis*

Relicensing studies conducted by PG&E indicate that existing minimum instream flows provide good water quality with temperatures in the optimal range (15 to 18°C) for

rainbow trout growth, and are similar both upstream and downstream of the diversion dams (Moyle and Marchetti, 1992). Therefore, it is likely that PG&E's proposal to continue to release minimum instream flows consistent with current conditions would continue to provide adequate habitat to maintain what appears to be self sustaining, viable populations of aquatic organisms present in these bypassed reaches. However, we do acknowledge that the information specific to the feeder creeks is limited.

Forest Service requirements and recommendations from FWS and Cal Fish & Game would provide additional flows downstream of these diversion dams compared to PG&E's proposal, which is consistent with current conditions. These additional flows would likely provide a greater amount of habitat for aquatic organisms such as trout, benthic macroinvertebrates, and amphibians residing downstream of these diversion dams. Additionally, these differences in minimum instream flows between PG&E's proposal and recommendations from the FWS and the Forest Service create virtually no difference in the daily maximum temperature at the lower end of the upper Butte Creek reach for either 2004 or 2005 (figures 3-45 and 3-46).

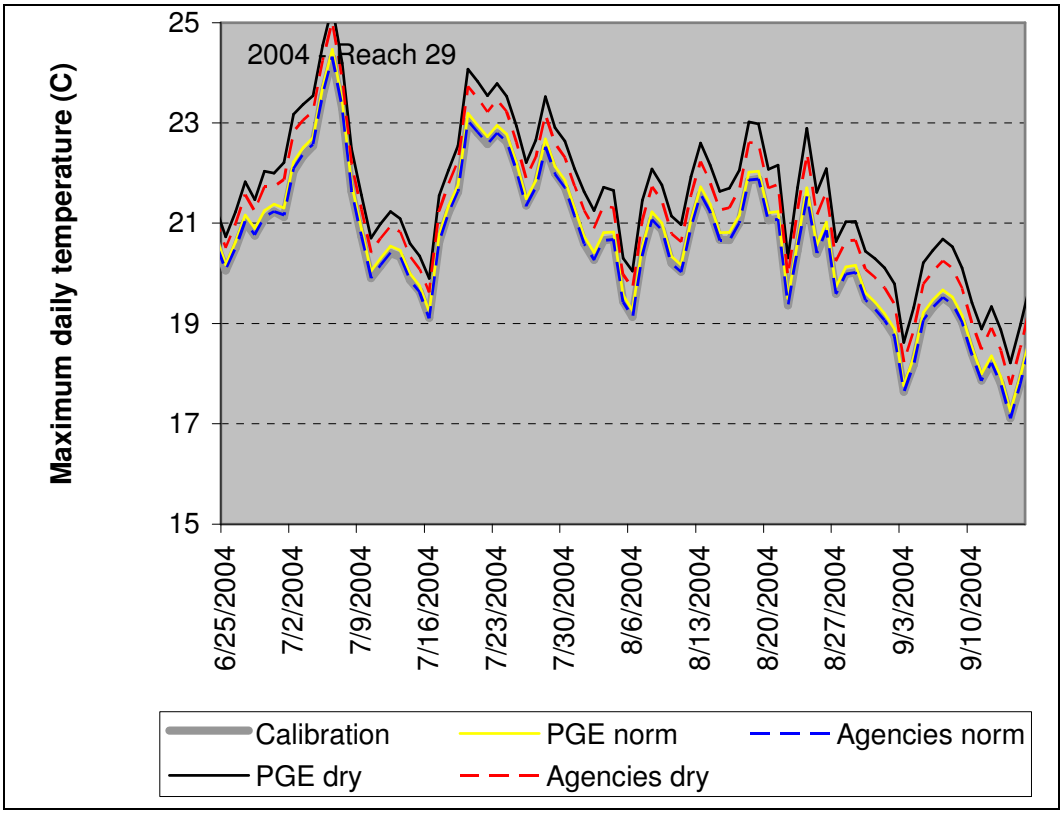


Figure 3-45. Predicted maximum daily temperature of the most downstream reach of upper Butte Creek for PG&E's and agency recommended minimum instream flow requirements for both dry and normal years for 2004. Results from the original calibration model run (actual flows for 2004) are included for comparison. (Source: Staff)

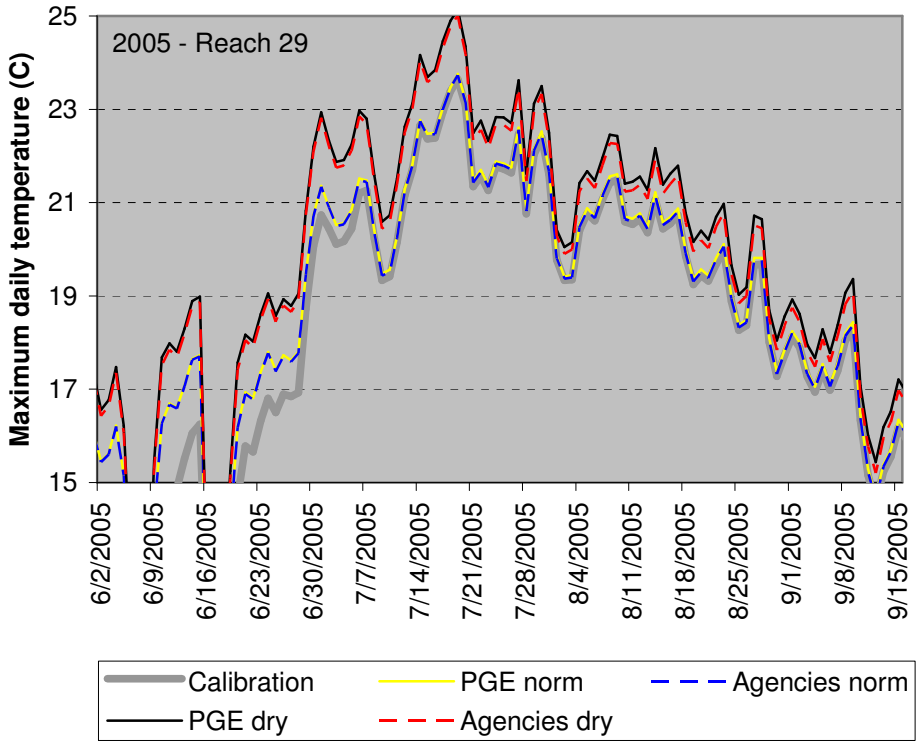


Figure 3-46. Predicted maximum daily temperature of the most downstream reach of upper Butte Creek for PG&E's and agency recommended minimum instream flow requirements for both dry and normal years for 2005. Results from the original calibration model run (actual flows for 2005) are included for comparison. (Source: Staff)

During the April 13, 2009, section 10(j) meeting the Forest Service stated its required minimum instream flows for the feeder creeks under its jurisdiction (Long Ravine, Cunningham Ravine, and Little West Fork creeks) were based not solely on providing adequate habitat for resident fish species, but also to fulfill habitat requirements of foothill yellow-legged frogs, which utilize these creeks as over-wintering areas. The Forest Service stated that based on some basic estimates of perimeter, minimum instream flows proposed by PG&E, were insufficient and that minimum instream flows of 0.1 cfs have been observed to cause the stream to dry up downstream of the diversion dams. Additionally, the Forest Service also stated that the other feeder creeks outside its jurisdiction (i.e., feeder creeks in Butte Creek drainage) would likely have similar relationships.

Upper Centerville canal has not been used for project operations for many years and currently carries only a few cfs for local water users. Water can be released from the end of Upper Centerville canal where it discharges directly into Helltown Ravine. Historically, Helltown Ravine was used as an alternate route to transport flows from Upper Centerville canal to Centerville powerhouse when the DeSabla powerhouse was

offline. PG&E states in its reply comments to agency recommendations, preliminary terms and conditions, that any unused water from Upper Centerville canal travels down Helltown Ravine until it is intercepted by the Helltown diversion dam and flows into Lower Centerville canal where it is picked up for generation. Water that is not diverted into Lower Centerville canal continues to flow through Helltown Ravine until it discharges into Butte Creek upstream of the Centerville powerhouse. Further, FWS states in its justification for 10(j) recommendation 2.6 that all of the current flows in Helltown Ravine are diverted into Lower Centerville canal (NMFS, 2008).

During preliminary field observations by PG&E, observations indicated that immediately downstream of the Lower Centerville canal diversion dam, Helltown Ravine was dewatered with water occurring only in pools from subterranean inflow. Also during these observations, many foothill yellow-legged frogs and California newts were observed, as well as a trout. Because project operations can potentially dewater the bypassed reach in Helltown Ravine, recommendations by FWS and Forest Service for a minimum instream flow of 1 cfs or natural flow during normal water years and 0.5 cfs or natural flow during dry water years would ensure the bypassed reach in Helltown Ravine would not become dewatered as a result of project operations. Providing this minimum instream flow would also provide habitat for amphibians, trout, and other aquatic species.

The Conservation Groups recommend that if the Commission does not adopt the Conservation Groups' proposed preferred alternative, then PG&E shall provide a minimum bypass flow of 1 cfs in Helltown Ravine downstream of Lower Centerville canal to benefit a known population of foothill yellow-legged frogs. This recommendation from the Conservation Groups is similar to that recommended by FWS and the Forest Service during normal years; however, this recommendation by the Conservation Groups would provide an additional amount of flow, and therefore, additional habitat during dry water years.

As discussed in the *DeSabla Forebay* section below, PG&E is proposing, and the agencies are recommending that a pipe be constructed and operated as a way to reduce thermal loading within the forebay. As a result of operating this pipe, the discharge from Butte canal would now be transported to the DeSabla forebay intake, bypassing the forebay and preventing this colder water from mixing in the forebay and reducing water temperatures. Because water used to supply Upper Centerville canal would be drawn from DeSabla forebay, it is likely that any flow discharged into the canal for use by domestic water users, or to supply minimum instream flows in Helltown Ravine, would be warmer compared to current conditions. Upon flows from Helltown Ravine entering lower Butte Creek, any increase in water temperatures within Helltown Ravine could also result in an increase in water temperatures in lower Butte Creek. These warmer water temperatures have the potential to negatively affect aquatic resources which reside not only in Helltown Ravine, but also in lower Butte Creek, which supports federally listed spring-run Chinook salmon. However, absent water temperature modeling or monitoring

within Helltown Ravine, the extent of any potential negative effects as a result of providing a minimum instream flow to Helltown Ravine are currently unknown.

*Butte Creek Feeder Creeks-Little Butte, Stevens, Emma Ravine, Coal Claim Ravine, and Oro Fino Ravine Creeks*

PG&E proposes to remove five feeder diversions since use of these feeder diversions have been discontinued and not used for over 10 years. These feeder diversions include: Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine feeders on the Lower Centerville canal; Stevens Creek feeder on the Butte canal; and Little Butte Creek feeder on the Hendricks canal. This proposal is consistent with Cal Fish & Game in 10(j) recommendation 9, which further recommends that PG&E obtain all necessary permits and approvals to remove these five diversion facilities. Cal Fish & Game also recommends that PG&E should notify the Water Board of the need to amend its water right to remove these points of diversion and that PG&E notify Cal Fish & Game prior to any ground disturbing activities.

The Forest Service in modified 10(a) recommendation 3 and FWS in 10(j) recommendation 3 recommend that PG&E develop and implement a Feeder Creek diversion facility removal plan in consultation with the resource agencies to address the removal of the following diversions in the Butte Creek watershed: Stevens Creek, Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine creeks. We further discuss this plan and how the removal of these feeder diversions may affect water quality below.

FWS in 10(j) recommendation 2.6 recommends that until the time that natural flows upstream of the Little Butte Creek diversion decrease to 1 cfs, PG&E shall release a bypass flow of 1 cfs or natural flow during normal water years and 0.5 cfs or natural flow during dry water years.

*Our Analysis*

Because the feeder diversions on Little Butte, Stevens, Emma Ravine, Coal Claim Ravine, and Oro Fino Ravine creeks have not been in operation for over 10 years, PG&E is proposing to remove these diversions. PG&E's proposal, consistent with Cal Fish & Game's 10(j) recommendation 9, to remove the project feeder diversions on Oro Fino Ravine, Emma Ravine, Coal Claim Ravine, Stevens Creek, and Little Butte Creek would restore the natural hydrology to these feeder creeks, and improve passage for aquatic organisms inhabiting these creeks. It is likely that the process of removing these feeder diversions, as proposed by PG&E and as recommended by Cal Fish & Game, would require instream and ground disturbance which could lead to increased turbidity levels, and potential negative effects on downstream water quality, as discussed below.

FWS in 10(j) recommendation 2.6 recommends that PG&E provide a minimum instream flow downstream of the Little Butte Creek diversion dam, as described above.

However, PG&E proposes to remove this feeder diversion along with the four others that are also no longer in use. As discussed above, removing this diversion would allow stream flows in this reach to return to natural conditions, eliminate any project -related effects on this creek, and eliminate the need for a minimum instream flow.

Developing and implementing a Feeder Creek diversion facility removal plan, as recommended by the Forest Service and FWS, would allow for a removal schedule and methods for removal to be developed, as well for mitigation measures to be developed to reduce potential environmental effects such as increases in instream turbidity or sedimentation levels. Including Little Butte Creek in the Feeder Creek diversion facility removal plan would also minimize any negative effects on aquatic resources in this creek, as discussed above. Further, Cal Fish & Game's recommendation for PG&E to provide notification prior to any ground disturbance related to removing the diversions would allow for Cal Fish & Game to be made aware of these efforts that could potentially affect aquatic resources in the bypassed reach.

*West Branch Feather River Feeder Creeks-Long Ravine, Cunningham, and Little West Fork Creeks*

PG&E proposes to release a minimum instream flow of 0.5 cfs, or inflow, during normal water years, and 0.25 cfs, or inflow, during dry water years, on a year-round basis downstream of the diversion dam on Long Ravine. PG&E also proposes to release a minimum instream flow of 0.25 cfs, or inflow, during normal water years, and 0.1 cfs, or inflow, during dry water years, on a year-round basis downstream of the Cunningham and Little West Fork diversion dams. These proposals are consistent with minimum instream flows under the existing license.

FWS in 10(j) recommendation 2.6 and Cal Fish & Game in 10(j) recommendation 1 recommend that PG&E release a year-round bypass flow of 1 cfs or natural flow, during normal water years and 0.5 cfs or natural flow, during dry water years downstream of the diversion on Long Ravine, Cunningham Ravine, and Little West Fork creeks. The recommendations for Long Ravine Creek are consistent with Forest Service preliminary 4(e) condition 18.1. However, the Forest Service in preliminary 4(e) condition 18.1 specifies that for Cunningham and Little West Fork creeks that PG&E release a mean daily flow of 1 cfs or the natural flow in all water year types.

In its July 30, 2008, alternative 4(e) conditions filed with the Forest Service, PG&E restates its original proposal in the license application, as described above.

The Forest Service in modified 4(e) condition 18.1 specifies that PG&E install pipes in the Hendricks/Toadtown canal to deliver instream flows into Long Ravine, Cunningham Ravine, and Little West Fork creeks downstream of the Hendricks/Toadtown canal and that PG&E perform regular maintenance on these pipes to ensure proper operation and that they do not become clogged with debris. The Forest

Service further specifies that each pipe have a maximum inside diameter of 4 inches and be installed such that the bottom of said pipe in no more than six inches above the bottom of the canal.

During the April 20, 2009, section 10(j) meeting the Forest Service stated its required/recommended minimum instream flows for the feeder creeks were based not solely on resident fish species, but also on the requirements of foothill yellow-legged frogs, which utilize these creeks as over-wintering areas. The Forest Service stated that based on some basic estimates of perimeter, minimum instream flows proposed by PG&E, were insufficient.

*Our Analysis*

Relicensing studies conducted by PG&E indicate that existing minimum instream flows provide good water quality with temperatures in the optimal range (15 to 18°C) for rainbow trout growth, and are similar both upstream and downstream of the diversion dams (Moyle and Marchetti, 1992). Therefore, it is likely that PG&E's proposal to continue to release minimum instream flows consistent with current conditions would continue to provide adequate habitat to maintain what appears to be self sustaining, viable populations of aquatic organisms present in these bypassed reaches. However, we do acknowledge that the information specific to the feeder creeks is limited. Forest Service requirements and recommendations from FWS and Cal Fish & Game would provide additional flows downstream of these diversion dams compared to PG&E's proposal. These additional flows would likely provide a greater amount of habitat for aquatic organisms such as trout, benthic macroinvertebrates, and amphibians residing downstream of these diversion dams.

The Forest Service states in its rationale for modified 4(e) condition 18.1 that PG&E's proposed minimum instream flows, which are consistent with current conditions, do not provide adequate habitat and have been observed to dry up downstream of the release point of these diversion dams, limiting connectivity. The Forest Service's modified 4(e) condition would provide for the highest flows into the feeder streams when the canal is fullest, generally in the summer when conditions are most stressful to aquatic biota, and somewhat lesser amounts of water when water in the canal is reduced. The Forest Service estimates that its required 4 inch pipe would provide approximately 0.75 cfs when the canal is full, declining to 0.2 cfs when there is only one foot of water in the canal, and that these minimum instream flow requirements would account for only 1 to 2 percent of the total water diversions in Hendricks canal. Overall, these pipes would provide additional water, and therefore, additional habitat to aquatic organisms present in these feeder creeks. Constructing and operating these pipes would also eliminate the need to adjust flow release valves in response to water year conditions, and the development of a measurement procedure for assuring compliance with flows in all three tributaries, as was required in the Forest Service's preliminary 4(e) conditions.

*Ramping Rates*

Ramping rates are the rate at which flow is changed when moving from one instream flow release level to another. Rapid flow reductions in a stream channel could potentially desiccate aquatic habitat or strand fish and other aquatic organisms in areas of the channel that are relatively low-gradient, or where pockets or side channels exist in the river channel. Smaller juvenile fish (less than approximately 2 inches long) are most vulnerable to potential stranding due to weaker swimming ability and preference for shallower, near-shore areas with slower velocities. Upramping flows generally do not affect fish stranding; however, the magnitude of flow change both upward and downward can affect fish behavior and habitat use, as well as affect production of benthic macroinvertebrates, which are an important food source for most fish species. Rapid changes in flow also can affect benthic macroinvertebrates, which become vulnerable to stranding and drift. Similarly, during relicensing studies conducted by PG&E, populations of foothill yellow-legged frogs were observed throughout the project area in both Butte Creek and the West Branch Feather River; therefore, also making early life stages of foothill yellow-legged frog egg masses or tadpoles susceptible to up- or downramping rates caused by project operations.

Currently, the only ramping rates implemented in project-affected stream reaches are those specified by the annual Operations and Maintenance Plan developed in consultation with the resource agencies under which PG&E has operated from 1999 through present. Under these annual plans, a ramping rate of 0.1 ft/hour change in water surface elevation has been implemented since 2005 from mid-November through July downstream of Lower Centerville diversion dam on Butte Creek. These ramping rates are implemented to protect federally listed salmonid fry, which are present in this reach from November (spring-run Chinook) through July (steelhead). However, from August through mid-November the plan states lower Centerville canal flow restoration events are unlikely and that if higher ramping rates are desirable, PG&E would consult with Cal Fish & Game and NMFS to determine appropriate ramping rates.

NMFS recommends in 10(j) recommendation 2, that during upramping, PG&E shall control ramping in lower Butte Creek so that velocity does not change more than 0.2 feet per second per hour. NMFS states that these recommended ramping rates would be protective of amphibian species and that because these ramping rates mimic the natural hydrograph, they would also protect steelhead and spring-run Chinook salmon present in lower Butte Creek.

FWS recommends in 10(j) recommendation 2 that if sufficient water is not available to hold stream stage levels constant during periods when foothill yellow-legged frog egg masses are present in project-affected stream reaches, the flow releases shall be based on combined conditions of water velocity and stage in foothill yellow-legged frog breeding areas. Further, FWS recommends that: (1) if eggs are laid at a high flow level,

then during downramping, stage changes shall not occur at a rate greater than 0.2 foot per second per hour at the egg mass site and water levels shall not drop to the extent that more than 20 percent of egg masses are de-watered; (2) during upramping, velocity shall not change more than 0.2 foot per second per hour and shall not exceed 0.8 foot per second at the egg mass site; and (3) when foothill yellow-legged frog tadpoles or juveniles are present, the up- and downramping rate shall be 0.4 foot per second per hour or less and shall not exceed 1 foot per second at the site.

FWS further recommends in 10(j) recommendation 2, that the information from monitoring of foothill yellow-legged frog populations as recommended in FWS' 10(j) recommendation 7 be used to determine the timing and to assess the level of allowable stream flow change that causes minimal loss of foothill yellow-legged frog egg masses or tadpoles. Also, the FWS recommends, that results from the fish and foothill yellow-legged frog monitoring plans, as discussed below, be reviewed by the resource agencies and the Commission to determine if their required and recommended ramping criteria is protective of the fish and foothill yellow-legged frog populations in the project reaches or if there is a need for modification. We discuss these measures pertaining to fish monitoring in the following section and foothill yellow-legged frog monitoring in section 3.3.3, *Terrestrial Resources*.

FWS and NMFS further recommend that in the event that monitoring during the term of the license identifies the need for modifications to the ramping rates, PG&E shall consult with the resource agencies to establish more appropriate ramping rates.

The Conservation Groups in their recommendation 8, recommend that PG&E time canal maintenance outages on Butte and Hendricks/Toadtown canals to take place as early in the spring as is it is reasonably safe to do so, in order to prevent scouring or dewatering of foothill yellow-legged frog egg masses in the West Branch Feather River downstream of Hendricks diversion dam.

In its alternative 4(e) conditions filed with the Forest Service, PG&E proposes that to protect foothill yellow-legged frog populations and address ramping rates, they would:

- Schedule outages as early in the year as possible to avoid the foothill yellow-legged frog breeding and rearing season;

- Changes in releases at the diversion will be avoided at critical times in the life history of foothill yellow-legged frog;

- Upramping, while taking the canal off-line after a seasonal maintenance outage, and downramping, while bringing the canal back online after a seasonal maintenance outage, will occur slowly in order to avoid the potential for dislodging foothill yellow-legged frog egg masses, or flushing or stranding tadpoles, as well as the potential for other ecological impacts;

- Should an unscheduled emergency outage occur during foothill yellow-legged frog tadpole rearing, downramping, while bringing the canal back online, will occur slowly in order to allow tadpoles the opportunity to move with the waterline and avoid stranding;

- Upramping and downramping rates under above conditions shall be limited to:

  - April-October-0.1 foot per hour
  - November-March-0.2 foot per hour

PG&E further proposes in its alternative 4(e) condition that in the case of equipment malfunction, emergency and law enforcement activity, and critical electric system emergencies beyond the control of PG&E, PG&E would communicate with the Forest Service as soon as practicable.

The Forest Service in modified 4(e) condition 18.5 requires that within 1 year of license issuance, PG&E implement an Instream Flow-Ramping Rate Study. The Forest Service states the objective of this study is to measure the change in water velocities, stream width, and river stage in the West Branch Feather River during up- and downramping of scheduled and non-scheduled canal outages or releases from Philbrook reservoir and that the information will be used to develop ramping rates that will protect aquatic resources. The Forest Service specifies monitoring will occur at two sites on the West Branch Feather River above Hendricks diversion and two sites below Hendricks diversion on National Forest System lands or other acceptable sites approved by the Forest Service and other agencies. The Forest Service further specifies this study would utilize a transect based approach, targeting a 0.10 foot per hour stage change for the controllable flow release, based on use of existing PHABSIM data to calculate the approximate flow increment that produces a 0.10 ft stage change. This study would be conducted within 2 years of the issuance of the new license under dry/normal water year flow conditions (based on the DWR Bulletin 120 March 1st forecast indicating less than 100 percent of normal unimpaired runoff for the Feather River at Oroville) and will be timed to avoid local storm conditions. If conditions are not suitable within the first 2 years (e.g., water year type or local storm conditions), the study will be conducted within the first year thereafter with suitable stream conditions.[46]

*Our Analysis*

Fluctuations in project-related flows may result in dramatic changes over the short-term to the wetted-perimeter of stream channels. The magnitude and temporal progression of the change is a function of the stream channel morphology, and the extent

[46] Additional details regarding the Instream Flow-Ramping Rate Study are contained in the Forest Service's final 4(e) conditions, filed April 27, 2009.

of flow fluctuations in the reach. Impacts associated with ramping vary, depending on the aquatic species present, life-stage, and timing or duration of the ramping event. Limiting ramping rates would decrease the potential for stranding of aquatic organisms to occur in shallow areas, and lessen the potential to disrupt these organisms, including salmonid fry, inhabiting shallow edge water habitats. Also, high flows such as those caused by storms, runoff, or uncontrolled project-related flows have been shown to scour foothill yellow-legged frog egg masses from the substrate (Ashton et al., 1998).

Overall, it appears that the intent of recommendations submitted by the FWS, NMFS, and the Forest Service in modified condition 18.5 are the same. The Forest Service, FWS, and NMFS state their respective conditions and recommendations are based upon studies which indicate reducing changes in both river stage and water velocity are important to protect foothill yellow-legged frog populations in natural stream conditions, with changes in velocity being more important than stage when ramping up flows, and that changes in stage where de-watering is possible has a greater effect on foothill yellow-legged frog survival than changes in velocity. Therefore, these agencies state their respective conditions and recommendations are based upon both a rate of change and maximum velocity for the protection of both foothill yellow-legged frog egg masses and tadpoles, which are vulnerable to stranding during downramping and detachment from the substrate during high flows.

It is likely that PG&E's proposed ramping rates in its alternative 4(e) condition would be more protective of foothill yellow-legged frogs and other aquatic resources downstream of the Hendricks diversion dam compared to existing conditions since no ramping rates currently exist. However, the Forest Service modified condition 18.5 requires that PG&E implement an Instream Flow-Ramping Rate Study in the West Branch Feather River. This study, as described above, would allow for site-specific data to be collected in the West Branch Feather River to document how changes in flow releases from Philbrook reservoir and at Hendricks diversion dam affect water depth and velocity at various locations within the stream channel. Specifically, this study would focus on how changes in flow releases affect stream margin habitat, which serves as an important spawning and rearing area for aquatic species such as rainbow trout and foothill yellow-legged frogs, which are present in the West Branch Feather River.

Once data is collected for this study, the Forest Service further requires that PG&E consult with the Forest Service, and other interested governmental agencies, to develop ramping rates that would be protective of aquatic resources in the West Branch Feather River. Although similar to recommendations submitted by NMFS, and by PG&E in its proposal contained in its alternative 4(e) condition, Forest Service modified condition 18.5 would likely be more protective of aquatic resources since actual site-specific information would be collected, and used by PG&E and the agencies collaboratively establish ramping rates in the West Branch Feather River.

Ramping rates recommended for other project-affected reaches by NMFS (Lower Butte Creek), and FWS (Lower and Upper Butte Creek) are also based on changes in stage and velocity, and would provide greater protection from excessive ramping rates compared to current conditions. However, overall FWS recommendations would likely be more protective of aquatic organisms since NMFS only recommended upramping rate restrictions in Lower Butte Creek, whereas FWS has recommended both up- and downramping rates based on site specific locations of foothill yellow-legged frog egg mass sites in both Lower and Upper Butte Creek.

The degree to which any instream flows and ramping rates implemented affect foothill yellow-legged frog populations is unknown. Monitoring the effect of flow releases on foothill yellow-legged frog populations would be needed to determine whether changes in project operation are adversely affecting foothill yellow-legged frogs, and to develop measures such as modified ramping rates that may be warranted to reduce adverse effects. As discussed below in section 3.3.3.2, *Terrestrial Resources*, Forest Service modified 4(e) condition 18.5 and FWS 10(j) recommendation 2 support monitoring foothill yellow-legged frog populations, which would allow for an assessment of the affects of any required ramping rates on these populations. If ramping rates were determined to be negatively affecting foothill yellow-legged frogs, the information gathered as a result of this foothill yellow-legged frog population monitoring would help support potential modifications to the ramping rates. Consulting with the resource agencies, as specified by the Forest Service and recommended by NMFS and FWS, on any proposed modifications to the ramping rates would ensure a collaborative approach with input from the agencies.

Consistent with recommendations from the Conservation Groups, PG&E also proposes in its alternative 4(e) conditions to schedule canal outages as early in the year as possible to avoid the foothill yellow-legged frog breeding and rearing season, and to implement changes in releases at the diversion to avoid critical times in the life history of foothill yellow-legged frog. These proposals would likely further protect foothill yellow-legged frog populations downstream of Hendricks diversion dam by minimizing effects on the critical life stages such as the egg and tadpole stages. Based upon the life history of foothill yellow-legged frogs in the project area, completing canal outages prior to the breeding season, which typically begins in May, would benefit the frog.

PG&E further proposes in its alternative 4(e) condition that in the case of equipment malfunction, emergency and law enforcement activity, and critical electric system emergencies beyond the control of PG&E, PG&E would communicate with the Forest Service as soon as practicable. Providing this notification would allow for a rapid response by the Forest Service to take any actions deemed necessary to protect resources on Nation Forest System lands downstream of the Hendricks diversion dam on the lower West Branch Feather River.

*Water Year Type*

PG&E proposes that a dry water year is any 12-month period beginning May 1 in which the natural runoff of the Feather River at Oroville for the April 1 to July 31 period, as forecast on April 1 by the California DWR, and as may be adjusted by the State on May 1, will be 50 percent or less of the average for such period as computed by the state for the 50-year period used at the time. If during a designated dry water year the February 1 or later water year prediction indicates that dry water year conditions no longer prevail, PG&E proposes to resume normal year flow releases immediately upon notification by Cal Fish & Game. This proposal is consistent with Cal Fish & Game 10(j) recommendation 10, FWS 10(j) recommendation 2, NMFS 10(j) recommendation 2, and Forest Service modified 4(e) condition 18.2; however, the Forest Service further specifies, and FWS and NMFS further recommend, that each February through May, PG&E would determine the water year type based on the DWR Bulletin 120 water year forecast and operate for that month based on that forecast, with the May forecast being used to establish the final water year type for the remaining months of the water year. FWS and NMFS also further recommend that the water year type for the months of October through January shall be based on the DWR's Full Natural Flow record for the Feather River at Oroville for the preceding water year.

The Forest Service in modified 4(e) condition 18.2, FWS in 10(j) recommendation 2, Cal Fish & Game 10(j) recommendation 10, and NMFS in 10(j) recommendation 2 further require or recommend that a normal water year is any 12-month period beginning May 1 in which the natural runoff of the Feather River at Oroville for the April 1 to July 31 period, as forecast on April 1 by the DWR, and as may be adjusted by DWR on May 1, will be greater than 50 percent of the average for such period as computed by the DWR for the 50-year period used at the time. If during a designated normal year the February 1 or later water year prediction indicates that normal year conditions no longer prevail, PG&E would resume dry water year flow releases immediately upon this determination.

The Forest Service further specifies, and Cal Fish & Game, FWS, and NMFS further recommend, that PG&E give notice to the resource agencies and the Commission of the final water year type determination within 30 days of making the determination.

The Forest Service in preliminary 4(e) condition no. 18, FWS and NMFS recommend in their respective 10(j) recommendation 2, and Cal Fish & Game in 10(j) recommendation 8, recommend that by March 10 of the second or subsequent dry water year, PG&E notify the resource agencies of drought concerns and by May 1 of these same years, consult with the resource agencies to discuss the project's operational plans to manage the drought conditions. If the parties agree on a Revised Operational Plan ("Drought" Plan), then PG&E may begin implementing the Revised Operational Drought Plan as soon as it files documentation of the agreement with the Commission. If unanimous agreement is not reached, then PG&E would submit the Revised Operational

Drought Plan (that incorporates as many of the resource agencies' issues as possible and any assenting and dissenting comments) to the Commission, request expedited approval and implement the proposed Drought Plan until directed otherwise by the Commission.

In response to the Forest Service preliminary 4(e) condition 18, PG&E proposed that minimum instream flows triggered by the water year type (as determined by the DWR's publication of Bulletin 120 April through July Forecast) be implemented within two business days after Bulletin 120 is published. PG&E states DWR tends to publish (via email) the Bulletin 120 April through July Forecast on the 8th day of the month during February, March, April and May; however, the date of publication sometimes varies, hence the need for an implementation date that is referenced to the actual date of publication of Bulletin 120 (PG&E, 2008). Also in response to Forest Service preliminary 4(e) condition 18, PG&E proposes that: (1) they should notify the Forest Service and other interested governmental agencies of their drought concerns by March 15 of the second or subsequent dry water year; and (2) consultation with the Forest Service and other interested governmental agencies should occur by May 15 of the same years (PG&E, 2008). PG&E states that DWR's Bulletin 120 April through July Forecasts are typically not available until about the 8th day of March and May. PG&E further states the extra days will have no effect upon operations in March, but most importantly, this schedule will allow consultation with the agencies in May to include the results of DWR's final April through July Forecast for the year, as determined by around May 8 of each year when DWR typically publishes Bulletin 120.

NMFS, the Forest Service, and Cal Fish & Game state in their comment letters on the draft EA that these minor modifications to dates proposed by PG&E are acceptable. Additionally, these modifications are now contained in Forest Service modified 4(e) conditions 18.2 and 18.3.

*Our Analysis*

PG&E's proposed criteria used to determine wet and normal water years are consistent with those specified by the Forest Service and those recommended by Cal Fish & Game, FWS, and NMFS. Basing minimum instream flow releases on natural runoff forecasts for the April 1 to July 31 period from the DWR would ensure ample water is available in any given year to make the appropriate minimum instream flows releases previously discussed. Also, utilizing the February 1 or later water year prediction to potentially modify the water year type upon notification from Cal Fish & Game would further ensure appropriate minimum instream flows are being released. These criteria would also ensure water storage within Round Valley and Philbrook reservoirs were not compromised as a result of releasing too much water during dry conditions.

Implementing minimum instream flows triggered by the water year type within two business days after Bulletin 120 is published, as proposed by PG&E and specified by

the Forest Service in final 4(e) condition 18.2 would allow for the appropriate minimum instream flows to be quickly adjusted and released. Also, providing notification to the Commission, and the resource agencies, of the final water year type determination within 30 days of making the determination, as specified by the Forest Service, and recommended by Cal Fish & Game, FWS and NMFS, would ensure the Commission and agencies were aware of the minimum instream flows to be released.

Drought conditions in the project area have the potential to decrease the quantity of water available to operate the project and to increase water temperatures, which may have negative affects upon aquatic species in the project area. Currently, the project operates such that water is stored and released from Round Valley reservoir, followed by the release of water from Philbrook reservoir as temperatures warm during the summer months, as previously discussed. Providing notification to the resource agencies and the Commission of potential drought conditions and consulting with the resource agencies as specified by the Forest Service and recommended by FWS, NMFS, and Cal Fish & Game, would allow for potential changes to project operations to be considered that may be necessary to protect aquatic resources prior to prolonged drought conditions and the onset of extreme summer temperatures. Such consultation would likely involve discussing how best to manage reduced water quantities in the project reservoirs and minimum instream flows as they pertain to protecting aquatic resources in the project area, including spring-run Chinook salmon in lower Butte Creek. Any proposed changes to project operations as a result of any drought related consultation would need to be filed with the Commission for approval, prior to implementation. We further discuss managing project operations via an adaptive management approach in section 5.2.

PG&E's proposal, consistent with Forest Service modified 4(e) condition 18.3, to provide notification and consult with the agencies by May 15 would ensure the DWR's Bulletin 120 April through July forecasts are available for reference. This would also allow consultation in May to include the results of DWR final April through July forecast for the year.

Alternatively, a Revised Operational Plan (Drought Plan) developed in consultation with the resource agencies, as recommended by the Forest Service and recommended by FWS, NMFS, and Cal Fish & Game would allow for a revised project operations protocol to be in place prior to the onset of multiple dry water years.

*Instream Flow and Reservoir Level Monitoring*

Compliance measures such as flow monitoring allows the Commission to ensure that a licensee complies with environmental requirements such as minimum instream flows or ramping rates of a license. Currently, minimum instream flows are measured at the gages identified in table 3-1.

Consistent with FWS 10(j) recommendation 17, NMFS 10(a) recommendation 2, and Cal Fish & Game 10(j) recommendation 5, PG&E proposes to install and maintain, a flow data logger for measuring stream flow downstream of Hendricks diversion dam on the West Branch Feather River, a real-time flow gaging station upstream of Butte Creek diversion dam, and to modify the existing stream gaging station near Lower Centerville diversion dam for real-time data access. PG&E proposes to consult with USGS to site, maintain and report information from these gages. The Forest Service in modified 10(a) recommendation 16 also recommends that PG&E install and maintain a gaging station upstream of the Butte Creek diversion dam, and for the gaging station upstream of Lower Centerville diversion dam to have real-time access.

The Forest Service specifies in modified 4(e) condition 18.4, and FWS in 10(j) recommendation 17 and NMFS in 10(a) recommendation 2, recommend that PG&E install a new gaging station that has real-time capability of reading river stage and minimum stream flow, downstream of the confluence of both the low level release and the spill channel in Philbrook Creek. Also, the Conservation Groups in 10(a) recommendation 12 recommend that PG&E provide stream flow and reservoir level information on the Internet for project streams and reservoirs.

The Forest Service in modified 4(e) condition 18.4 specifies, and FWS in 10(j) recommendation 17 and NMFS in 10(a) recommendation 2, recommend: (1) that PG&E operate and maintain the existing gages on the West Branch Feather River located downstream of Round Valley reservoir and Hendricks diversion dam, consistent with all requirements of the Commission and under the supervision of USGS; and (2) that any modification to the gage facilities at any of these gaging locations that may be necessary to measure the new minimum instream flows shall be completed within 3 years after issuance of the new license.

Cal Fish & Game in 10(j) recommendation 5 further recommends that over the term of the license, should additional gages become necessary based on the outcome of annual consultation and adaptive management, up to three additional gages may be required.

The Forest Service in modified 4(e) condition 18.1 specifies, and Cal Fish & Game in 10(j) recommendation 5, FWS in 10(j) recommendation 2, and NMFS in 10(j) recommendation 2, recommend, that minimum instream flows shall be measured in two ways: as the 24-hour average of the flow (mean daily flow) and as an instantaneous flow, with instantaneous 15-minute stream flow as required by the USGS standards at all

gages.[47] The Forest Service, FWS, and NMFS further require and recommend that the minimum instantaneous 15-minute stream flow shall be at least 80 percent of the prescribed mean daily flow for those minimum stream flows less than or equal to 10 cfs and at least 90 percent of the prescribed mean daily flow for those minimum stream flows required to be greater than 10 cfs. Should the mean daily flow as measured be less than the required mean daily flow set forth in minimum instream flow schedules, but more than the instantaneous flow, FWS and NMFS recommend, and the Forest Service specifies, that PG&E begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release. Credit for such additional releases will not exceed 20 percent of the instantaneous flow amount, when used to attain the equivalent of the under-released volume. Consistent with PG&E's proposal, FWS and NMFS recommend that instantaneous instream flows may deviate below the specified minimum instream flow releases by up to 10 percent or 3 cfs, whichever is less.

PG&E proposes to make the following daily average stream flow information available to the public annually from May 1 through November 30: on the West Branch Feather River at USGS gage no. 11405200 (downstream of Hendricks diversion dam), and on Butte Creek at USGS gage nos. 11389720 (downstream of Butte Creek diversion dam) and 111389780 (downstream of Lower Centerville diversion dam). PG&E further recommends that this flow information would be made available to the public via the Internet, which may be accomplished through a third party. Because this proposal by PG&E is intended to provide more readily available stream flow data to recreationists in key project reaches, we further discuss this measure in section 3.3.5, *Recreation Resources*. Also, the Conservation Groups in 10(a) recommendation 12 recommend that PG&E provide stream flow and reservoir level information on the Internet for project streams and reservoirs.

The Forest Service specifies in modified 4(e) condition 18.4, and Cal Fish & Game in 10(j) recommendation 5, NMFS in 10(a) recommendation 2, and FWS in 10(j) recommendation 17, recommend that data recorded at these streamflow gages be made publicly available and in readily accessible formats, be provided to the USGS in annual hydrology reports after a quality control review so data can be posted on-line, and be made available to the resource agencies upon request.

NMFS further recommends in its 10(j) recommendation 8 that a long-term operations plan, as further discussed below, should contain provisions for installation of remote operating capability and additional real-time water temperature and reservoir

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[47] The instantaneous flow is the flow value used to construct the average daily flow value and shall be measured in time increments of at least 15-minutes. The 24-hour average flow is the average of the incremental readings from midnight of one day to midnight of the next day.

elevation and flow gages in Round Valley and Philbrook reservoirs. NMFS recommends the location of these gages would be agreed upon by Cal Fish & Game and NMFS.

CSSA recommends that streamflow gages be installed below all dams and diversions and that PG&E be required to check all gages on a monthly basis, at a minimum. This recommendation by CSSA is consistent with Forest Service requirements and recommendations made by the agencies. Therefore, we discuss below the need for streamflow gages in the project-area on a reach by reach basis.

*Our Analysis*

Currently, stream flow and reservoir elevations in the project area are monitored at the locations identified in table 3-1, which are maintained by PG&E in cooperation with the USGS. Except for the USGS gages on Butte Creek near Chico (USGS gage no. 11390000) and the West Branch Feather River near Paradise, CA (USGS gage no. 11405300), estimates of flow within the bypassed reaches of Butte Creek and West Branch Feather River are incomplete because these stream flows often exceed the rating curve of these streamflow gages, especially during late winter through early spring when the project area experiences high runoff. Enhanced gaging at select locations within the project area in both the Butte Creek and West Branch Feather River watersheds would be beneficial given the inter-basin transfer of water and the importance of monitoring and managing flows for spring-run Chinook salmon and steelhead within lower Butte Creek.

Currently, no streamflow gage exists upstream of the Butte Creek diversion dam and the flows above this diversion dam are estimated by summing flows recorded in Butte canal (PG&E gage no. BW14) with flows from the streamflow gage downstream of the diversion (USGS gage no. 11389720). However, as discussed above, the streamflow gage downstream of Butte Creek diversion dam oftentimes does not record all flows during periods of high runoff. This also holds true for the streamflow gage downstream of Hendricks diversion dam on the West Branch Feather River (USGS gage no. 11405200). Further, the current streamflow gage downstream of Lower Centerville diversion dam (USGS gage no. 11389780) does not have real-time capability. PG&E's proposal, which is consistent with Forest Service modified 4(e) condition 18.4, Forest Service modified 10(a) recommendation 16, FWS 10(j) recommendation 17, NMFS 10(a) recommendation 2, and Cal Fish & Game 10(j) recommendation 5 to install and maintain a real-time flow gaging station upstream of Butte Creek diversion dam, to install and maintain a flow data logger for monitoring stream flow downstream of Hendricks diversion dam, and to modify the streamflow gage downstream of Lower Centerville diversion dam to have real-time capability would provide additional and more accurate stream flow data at key locations on Butte Creek and the West Branch Feather River. This data would assist in managing project operations for the benefit of aquatic resources in both watersheds, including spring-run Chinook salmon in lower Butte Creek. Real-time capability would also allow for flows in Butte Creek to be immediately available

and would allow for any sudden stream flow changes as a result of weather conditions or project -related emergencies to be quickly identified and for a rapid response, if necessary. A streamflow gage upstream of Butte Creek diversion dam would also allow all flows entering the Butte Creek drainage system upstream of the dam to be accurately monitored before being diverted for project operations. PG&E's proposal to consult with the USGS to site, maintain and report information from these gages would further ensure these gages meet USGS standards and are collecting the most accurate data possible.

Non-spill releases and minimum instream flows are made from the main dam on Philbrook reservoir via a low-level outlet directly to Philbrook Creek. In addition, flows from two spillways join Philbrook Creek approximately 1,000 feet downstream of the main dam. Currently, PG&E's gage no. BW3 only monitors flow releases from the low-level outlet out of the main dam and does not capture any flow from over the spillways.

Water is released from Philbrook reservoir as high temperatures occur during the summer months for the benefit of federally listed species in lower Butte Creek. The storage and release of water from Philbrook reservoir is vital to manipulating water temperatures in lower Butte Creek. Installation of a real-time flow gage in Philbrook Creek, downstream of the confluence of both the low level release and the spill channel, as specified by the Forest Service in modified 4(e) condition 18.4 and as recommended by FWS in 10(j) recommendation 17, NMFS 10(j) recommendation 8, and NMFS in 10(a) recommendation 2, would allow for all stream flows and river stage in Philbrook Creek to be monitored. Accurately monitoring flows in this reach would better allow for assessing how project operations and flows in Philbrook Creek affect overall water temperatures in the West Branch Feather River and lower Butte Creek.

The Forest Service's modified 4(e) condition 18.4 and FWS' 10(a) recommendation 2 for PG&E to operate and maintain existing gages downstream of Round Valley reservoir and downstream of Hendricks diversion dam, consistent with all requirements of the Commission and under the supervision of the USGS, and to make any modifications to streamflow gages within 3 years would ensure minimum instream flows could be accurately monitored for compliance purposes in these reaches. NMFS 10(j) recommendation 8 is similar in that it recommends PG&E to install a new stream flow gage downstream of Round Valley reservoir with real-time capabilities. Similar to the discussion above for Philbrook Creek, constructing a stream flow gage in this reach to have real-time capability would allow for flows in this reach to be remotely monitored and allow for potential changes in project operations based upon flows in the upper West Branch Feather River to be made more rapidly than what currently occurs. However, we note that the need for a real-time stream flow gage in this reach may be unnecessary as once Round Valley reservoir is drained, this reach typically goes dry several times a year.

The Forest Service specifies in modified 4(e) condition 18.4, and Cal Fish & Game and FWS recommend in 10(j) recommendation 5 and 10(a) recommendation 2,

respectively, that PG&E: (1) measure and document all instream flow releases in publicly available and readily accessible formats, and that flow values used to construct the 24-hour average flows will be available to the resource agencies from PG&E upon request; and (2) and that flow data collected by PG&E be reviewed by PG&E's hydrographers as part of its quality assurance/quality control protocol and that the data will be catalogued and made available to USGS in annual hydrology summary reports so the USGS can complete its quality assurance/quality control review of the data and subsequently publish the data and post it on-line. These required and recommended measures would ensure all stream flow data from gages within the project area are made available for quality review by the resource agencies and the USGS, and that the public would also have the opportunity to access this data once it is made available via the Internet. Having stream flow gages record minimum stream flows as the 24-hour average of the flow and as an instantaneous flow, with instantaneous 15-minute stream flow would ensure readings would meet USGS standards.

Currently, reservoir elevation data recorded for Round Valley and Philbrook reservoirs is synoptic and collected at weekly intervals when there is access to these sites. As part of a long-term project operations plan, as further discussed below, NMFS recommends that PG&E address the installation of real-time temperature and reservoir level monitors, as well as flow gages, in Round Valley and Philbrook reservoirs to allow for conditions in the reservoirs to be remotely monitored for project operations. Overall, these recommendations by NMFS would enable PG&E to better monitor environmental conditions and allow for project facilities to be remotely operated in an effort to further reduce and manipulate water temperatures in lower Butte Creek during hot times of year.

During the April 13, 2009, section 10(j) meeting, NMFS provided additional information regarding its recommendation for the installation of equipment at Round Valley and Philbrook reservoirs to allow them to be remotely operated by PG&E. NMFS stated that its main concern was PG&E's ability to quickly respond to heat events, and therefore increase flows from Philbrook reservoir, during summer months. PG&E stated that in the summer, adjustments to the valve releasing water from Philbrook reservoir is usually done in consultation with the resource agencies and that adjustments to the release valve can be accomplished within 2 hours. NMFS stated during the section 10(j) meeting it would be willing to withdraw the portion of its 10(j) recommendation 8 for the installation of remotely operated equipment based upon PG&E clarifying a rapid response is possible in during the summer months, if weather conditions dictate.

Cal Fish & Game recommends in 10(j) recommendation 5 that over the term of the license, up to three additional stream flow gages may be required based on the outcome of annual consultation and adaptive management. In Cal Fish & Game's February 27, 2009, letter in response to the Commission's preliminary determination of inconsistency letter, Cal Fish & Game provided additional information concerning the construction and operation of these three stream flow gages. Cal Fish & Game clarified that the costs and

locations of these gages is indeterminable because they are recommending these gages to be incorporated as part of an adaptive management strategy. Cal Fish & Game further stated that its concern is that if stream flow gages become necessary during the term of any license issued, unless the need for them is clearly defined in a license, then they would not be required by the Commission. Lastly, Cal Fish & Game recommended that an acceptable alternative would be to address the need for these gages in the adaptive management program, discussed below. During the April 13, 2009, section 10(j) meeting the need for these gages was also discussed and Commission Staff agreed that based on the additional information provided by Cal Fish & Game, including these stream flow gages as part of the adaptive management program would be an acceptable alternative. Upon Commission approval, this would allow for the installation of these gages, if needed, to monitor instream flows for compliance purposes, or to better manage the allocation of water throughout the West Branch Feather River and Butte Creek watersheds for the benefit of aquatic resources.

*Instream Flow Monitoring for Feeder Creeks*

Currently, the only feeder creek that contains a stream flow gage is Long Ravine Creek (USGS gage no. 11405220). The gaging station that determined flows in Hendricks canal after flows were diverted by Long Ravine diversion dam was discontinued in 1985, and the existing gage in Long Ravine Creek is intended to monitor compliance with minimum instream flows. Currently there is no way to determine the quantity of flow intercepted by the diversion dams on the various feeder creeks.

NMFS 10(a) recommendation 2 recommends that gaging stations be installed to measure river stage and minimum stream flows for compliance purposes at eight feeder creeks, including: the Butte Creek tributaries, Inskip, Kelsey, Helltown Ravine and Clear creeks, and the West Branch Feather River tributaries, Long Ravine, Cunningham Ravine, Little West Fork, and Little Butte Creek.[48] Consistent with recommendations from NMFS, Forest Service modified 10(a) recommendation 16, recommends the construction of stream flow gages for Inskip, Kelsey, Helltown Ravine, and Clear creeks downstream of their respective diversion dams.[49] FWS stated in its February 26, 2009, letter in response to the Commission's preliminary determination of inconsistency letter, comments that they no longer recommend the installation of stream flow gages on the feeder creeks (preliminary 10(j) recommendation 17) and that utilizing a rover operator to insure these diversions remain functioning as designed was an acceptable alternative.

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[48] The diversion on Little Butte Creek has only been used once during the past 20 years during spill events.

[49] We note that Forest Service final 10(a) recommendation 16 references a stream gage to be installed on Little Butte Creek but assume this is an oversight as the Forest Service is no longer recommending a MIF for this creek.

*Our Analysis*

The Butte Creek and West Branch Feather River feeder tributaries used for diversion purposes are small, perennial streams with medium to high gradient. All diversion dams are small, 4 to 10 ft across, and shallow, at less than 2 feet in depth. All minimum instream flows made downstream of the feeder diversions in the Butte Creek and West Branch Feather River watersheds are made via small (3- to 4-inch-in-diamter) pipes at the base of the diversions; however, PG&E states potential for blockage does exist at these diversion dams. Given the remote locations of these feeder diversions, and the high gradient of these stream reaches, installing stream flow gages at these locations would likely be difficult. Further, calibrating gages in such environments would also be difficult given the rough channel characteristics and topography, likely resulting in large amounts of uncertainty, possibly making accurate stream flow estimates inaccurate.

Further, consistent with NMFS 10(a) recommendation 2, FWS recommends in 10(j) recommendation 17 and the Forest Service recommends in modified 10(a) recommendation 16, that PG&E install a new gaging station to monitor river stage and minimum instream flows in Little Butte Creek. Under PG&E's proposal, the diversion dam on Little Butte Creek would be removed, as it has not been used in many years, as discussed above. As a result, PG&E also does not propose any minimum instream flows for this creek downstream of the diversion dam. Therefore, because this diversion would be removed under PG&E's proposal, project operations would no longer have any effect on stream flows in this creek, making a minimum instream flow and installation of a steam gage unnecessary.

NMFS in 10(a) recommendation 2, FWS in 10(j) recommendation 17, and the Forest Service in 10(a) recommendation 16, recommend that PG&E also install a new gaging station in Helltown Ravine. Upper Centerville canal, which ends at Helltown Ravine, was historically used as an alternative way to route water to Centerville powerhouse when the DeSabla powerhouse was offline. Water would be released from Upper Centerville canal into Helltown Ravine, where it would be captured via a diversion dam and flow into Lower Centerville canal. However, Upper Centerville canal has not been used for project operations for many years and as a result PG&E is not proposing a minimum instream flow for Helltown Ravine, as described above. However, FWS in 10(j) recommendation 2.6 and Forest Service in 10(a) recommendation 2.6 recommend a minimum instream flow for Helltown Ravine. If minimum instream flows are required for Helltown Ravine by any license issued for this project, a stream flow gage would allow stream flows and compliance with minimum instream flows to be monitored; however, as discussed above, terrain in the project area would likely make installing a stream flow gage in Helltown Ravine difficult.

During normal project operations, PG&E currently dispatches a roving operator to monitor and maintain these diversion dams on a weekly basis. Continuing to dispatch

roving operators to monitor and maintain feeder diversions would ensure all feeder diversions are working properly, not blocked with debris, and that they are providing any required minimum instream flow releases downstream of the diversion dams.

**Water Quality**

Water quality studies conducted by PG&E indicate occasional seasonal exceedances of the Basin Plan water quality objectives for bacteria and turbidity. PG&E's proposal to alter project operations also has the potential to alter water quality conditions in project reservoirs and in project -affected stream reaches in Butte Creek, the West Branch Feather River, and project feeder streams. Continued scheduled and unscheduled project canal outages are likely to cause increases in turbidity. In order to confirm water quality standards are met under any new license issued, it would be necessary to monitor selected water quality parameters, as described below.

CSSA filed multiple recommendations and concerns regarding water rights in Butte Creek and the West Branch Feather River. We have determined that these recommendations are water right issues that pertain to the State of California; therefore, we do not discuss these recommendations below.

*Monitor Water Quality in Receiving Stream during Canal Cleaning*

Project canals intercept overland flow and feeder tributaries at a number of locations, which lead to sediment deposition and accumulation within the bottom of project canals. Therefore, scheduled and unscheduled canal startup and shutdown has the potential to increase water velocities along the bottom of the canals as water levels fluctuate within the canal. This has the potential to mobilize these sediments and increase turbidity levels in the canals and receiving streams on discharge from the canal.

PG&E proposes to conduct water quality monitoring in receiving streams prior to, during, and after returning project canals to service. PG&E proposes sampling would occur within 24 hours of taking the canal out of service, once in the middle of the canal outage, and within 24 hours of placing the canal back into service. Routine monitoring would include sampling water quality in the receiving stream at one site upstream and downstream of the location the canal discharges water into the stream. Monitoring parameters would include water temperature, DO, and turbidity sampled at regular intervals. PG&E also proposes that, if herbicides are used along project canals, herbicide sampling would also be included with the routine monitoring. Lastly, PG&E proposes to provide a summary of cleaning and maintenance activities as well as the monitoring results to the Water Board, and to file the summary report with the Commission.

The Conservation Groups in 10(a) recommendation 14 recommend that PG&E provide turbidity sensors at four locations on Butte Creek: one immediately downstream of DeSabla powerhouse, one immediately downstream of Centerville powerhouse, and

two in between the powerhouses, as determined by the Operations Group. The Conservation Groups further recommend that these devices be telemetered and connected to the Internet through the California Data Exchange Center and that if and when Centerville powerhouse is decommissioned, the Operations Group would consider reducing the number of turbidity sensors. In their February 26, 2009, comment letter on the draft EA, the Conservation Groups clarified that the purpose of these proposed sensors are to serve as an early warning system for canal failure or other project anomalies, and to allow for quick detection and correction of problems.

*Our Analysis*

Scheduled and unscheduled canal outages have been shown through PG&E's water quality monitoring studies to result in short-term turbidity increases in receiving streams downstream of canal discharge. As previously discussed, oftentimes these increases in turbidity have been show to exceed the Basin Plan water quality objectives of <1 NTU increase. Increases in turbidity within the project area could potentially lead to a variety of negative effects on aquatic organisms, including siltation of spawning and rearing habitat for various aquatic species, including federally listed species in lower Butte Creek.

PG&E's proposal to conduct water quality monitoring in project waters receiving flows from project canals, before, during, and after an outage would allow for any increases in water temperature, DO, and turbidity to be documented. This monitoring as proposed by PG&E would alert personnel to possible water quality problems associated with canal outages and allow any problems to be quickly identified and for appropriate response actions to be undertaken. This monitoring would also allow for any violations of the Basin Plan water quality objectives to be identified and would ensure canal outages do not negatively affect water quality for extended periods of time. To be useful, monitoring reports should be compiled at regular intervals, and all violations of the state standard should be reported to proper agencies with a complete filing to the Commission.

PG&E states that it periodically cleans project canals, and sometimes uses herbicides in the vicinity of the canals to control vegetation. During 2007, prior to and during the first rainfall event following herbicide application, PG&E sampled for herbicides. No herbicide residues or degradation by-products were identified at levels above the analytical method detection limits in any samples collected prior to application or following resumption of canal operation. Current water sampling indicates periodic use of herbicides is not affecting water quality in project canals; however, in the event herbicides are utilized at a greater frequency, quantity, or different types are used, degradation of water quality in project canals could potentially occur, affecting resident aquatic organisms downstream. Therefore, in the event herbicides are used along project canals, herbicide sampling would allow for the presence of herbicides in project waters to

be rapidly identified and for corrective actions to be taken to ensure negative effects to water quality and aquatic organisms do not occur.

The Conservation Groups 10(a) recommendation 14 for PG&E to provide turbidity sensors at four locations on Butte Creek between the DeSabla powerhouse and just downstream of Centerville powerhouse would allow for continuous turbidity monitoring in Butte Creek. Having these monitors connected to the Internet would allow for any increases in turbidity to be remotely monitored. Installation and operation of these monitors may detect project-related events such as canal failures that cause turbidity increases, as indicated by the Conservation Groups. However, it is likely that these turbidity monitors would also detect other increases in instream turbidity that are not project-related (i.e., runoff or instream disturbance upstream of the sensors) over the course of approximately 7 river miles in Lower Butte Creek. The Conservation Groups rationale that this equipment would serve as an early warning system to larger scale problems would necessitate calibrating this equipment to detect small-scale increases in turbidity, which would also detect any other increases in turbidity, as previously mentioned. Therefore, it is unlikely that installation of such turbidity monitors would allow for a quicker response time than would occur as a result of powerhouse or canal alarms alerting the 24-hour personnel at the Rock Creek switching center.

*Canal Water Loss*

As further discussed in section 3.3.1, *Geologic and Soil Resources*, project canals traverse a variable geologic setting. Point and non-point sources of leakage from project canals have the potential to create localized areas of erosion. Increased erosion could lead to negative effects on water quality in either the Butte Creek or West Branch Feather River drainages, by increasing turbidity levels within these drainage basins. This has the potential to lead to increased levels of siltation, potentially having negative effects on the habitat of various aquatic species, including salmonid spawning habitat within Lower Butte Creek and the West Branch Feather River.

Consistent with Forest Service modified 4(e) condition 23, Cal Fish & Game 10(j) recommendation 7, FWS 10(j) recommendation 4, and NMFS 10(j) recommendation 3, PG&E proposes to develop in consultation with the Forest Service and the Water Board, and implement, a project canal maintenance and inspection plan. PG&E proposes the plan would detail its responsibility for the regular maintenance and inspection of project canals to address hazard trees and geologic hazards within the project boundary that may impact the integrity of project water conveyances. The plan would provide for, at a minimum: (1) annual inspections of the project water conveyance system to identify potential short-term and long-term hazards (e.g., hazard trees, landslides, etc) and to prioritize maintenance and/or mitigation; (2) protocols for routine (non-emergency) canal operations and the use of canal spillways; and (3) stabilization measures to reduce the

likelihood of catastrophic canal failure due to hazard trees and geologic hazards and to mitigate, as appropriate, sources of chronic erosion and sediment transport into canals.

The Forest Service further specifies and Cal Fish & Game further recommends that the plan address specific prevention measures to assure long-term integrity of the project canal system. Lastly, the Forest Service specifies and FWS and Cal Fish & Game recommend, that this plan include current standard operating procedures and any new procedures that may be developed to minimize canal outages, sediment events, and winter storm events, etc., that are not currently license requirements, and that PG&E develop specific preventative measures to address geologic hazards identified in relicensing studies.

*Our Analysis*

Water leakage associated with canal loss was not quantified during relicensing studies; however, small amounts of leakage have been observed at a variety of locations such as flume seams or holes, canal spillway gates, or along permeable berms. Leakage due to project operations can have negative effects on water quality if the quantity of leakage is great enough to cause localized areas of erosion which could increase turbidity levels within the drainage area. Also, non-point sources of canal leakage could lead to soil saturation, which could make areas more prone to canal failure due to landslides.

As discussed in section 3.3.1, *Geologic and Soil Resources*, PG&E's proposed and the agency recommended, project canal maintenance and inspection plan, would allow for the inspection of project canals to identify areas which may become short- or long-term hazards that lead to increased siltation and degraded water quality. Further, this plan would allow for the stabilization of problem areas to reduce current and future levels of erosion.

*Hazardous Substances/Pesticide Use*

Construction, operation, and maintenance of existing and proposed project facilities has the potential to contaminate waterways from the introduction of hazardous materials such as petroleum products resulting form accidental spill, equipment leakage, and from the use of herbicides/pesticides to control terrestrial and/or aquatic vegetation, insects, and other organisms in the project area.

Consistent with Forest Service modified 4(e) condition 34, PG&E proposes to file with the Commission, a plan approved by the Forest Service for oil and hazardous substances storage and spill and prevention and cleanup. PG&E proposes that this plan would require PG&E to: (1) maintain in the project area, a cache of spill cleanup equipment suitable to contain any spill from the project; (2) to periodically inform the Forest Service of the location of the spill cleanup equipment on Forest Service lands and of the location, type, and quantity of oil and hazardous substances stored in the project

area; and (3) to inform the Forest Service immediately of the nature, time, date, location, and action taken for any spill on or affective Forest Service lands.

BLM and the Forest Service in their respective modified 4(e) condition 11, specify that pesticides may not be used on BLM or Forest Service lands or in areas affecting BLM or Forest Service lands to control undesirable woody and herbaceous vegetation, aquatic plants, insects, rodents, trash fish, etc., without the prior written approval of BLM or the Forest Service. These agencies further require PG&E to submit a request for approval of planned uses of pesticides for the upcoming year during the annual consultation meeting required by their respective 4(e) condition 1, and that PG&E provide the following information at a minimum: (1) whether pesticide applications are essential for use on BLM or Forest Service lands; (2) specific locations of use; (3) specific herbicides proposed for use; (4) application rates, dose and exposure rates; and (5) safety risk and timeframes for application.

BLM and Forest Service further specify that pesticide use would be excluded from BLM and Forest Service lands that are within 500 feet of all known locations of California red-legged frog, mountain yellow-legged frog, foothill yellow-legged frog, and Yosemite toad.

BLM and the Forest Service further specify that PG&E use on BLM and Forest Service lands only those materials registered by EPA and consistent with those applied by BLM and the Lassen and Plumas National Forests and approved through BLM and Forest Service review for the specific purpose planned.

Lastly, BLM and the Forest Service further specify that PG&E may also provide an integrated pest management plan that describes planned pesticide use on a regular basis for the term of the license.

*Our Analysis*

The development and implementation of a hazardous substances plan as proposed by PG&E, consistent with Forest Service modified 4(e) condition 34 would provide for materials and cleanup equipment to be available for a rapid response if a hazardous spill were to occur in the project area. Further, this plan would serve as a reference for procedures to be followed in the event of a hazardous materials spill, potentially minimizing environmental impacts associated with a spill. Also, notifying the Forest Service of any such spills would allow the Forest Service to be involved in any spill cleanups on Forest Service lands.

BLM and the Forest Service's respective modified 4(e) condition 11 would assist in preventing the unauthorized use of potentially hazardous pesticides in the project area which could potentially degrade water quality and have negative affects on aquatic resources. Obtaining approval from BLM and the Forest Service would ensure pesticides

would be used only when necessary, and that they were used in an appropriate manner, as intended. Also, refraining from using approved pesticides within 500 feet of known locations of California red-legged frog, mountain yellow-legged frog, foothill yellow-legged frog, and Yosemite toad would minimize any negative effects to these sensitive aquatic species, if they are found to be present.

*Removal of Feeder Diversions*

The feeder diversions on Oro Fino Ravine, Emma Ravine, Coal Claim Ravine, Stevens Creek, and Little Butte Creek have not used for over 10 years. Consistent with Cal Fish & Game 10(j) recommendation 9, PG&E proposes to remove five feeder diversions, including those on Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine creeks that are diverted into Lower Centerville canal; the feeder diversion on Stevens Creek that is diverted into Butte canal; and the feeder diversion on Little Butte Creek that is diverted into Hendricks canal. Removing project facilities such as feeder diversions that are located within project -affected stream reaches has the potential to negatively affect water quality conditions downstream of each diversion during the demolition and removal of these facilities. Removal of these facilities may lead to increased levels of turbidity and sedimentation, which in turn could increase siltation of spawning habitat, thus, negatively affecting various resident aquatic organisms.

The Forest Service in modified 10(a) recommendation 3 and FWS in 10(j) recommendation 3 recommend that PG&E develop and implement a Feeder Creek diversion facility removal plan in consultation with the resource agencies to address the removal of the following diversions in the Butte Creek watershed: Stevens Creek, Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine creeks. The Forest Service and FWS further recommend that this plan include schedules, site plans, and mitigation measures for the removal of four specific feeder diversions.

Cal Fish & Game in 10(j) recommendation 10 further recommends that PG&E provide notification to Cal Fish & Game prior to any ground disturbance related to removing the feeder diversion dams.

PG&E does not propose specific measures to mitigate any potential negative water quality effects associated with the removal of these feeder diversions. We further discuss feeder streams, including stream gage installation, and minimum instream flows above.

*Our Analysis*

Habitat studies conducted by PG&E indicate that overall, project feeder creeks are located in high gradient streams dominated by larger substrates, including bedrock, boulders, and cobble. Due to the small size of these feeder diversions, it is likely that removing these facilities could occur relatively quickly with minimal ground disturbance. Any disturbance created in these streams would likely create only short-term increases in

turbidity given the absence of fine sediments in these the feeder creeks which are dominated by large substrate types. Any increases in turbidity would likely be rapidly flushed from each respective feeder creek as a result of the steepness of the terrain, preventing sediment accumulation and habitat degradation downstream.

Forest Service in modified 10(a) recommendation 3 and FWS in 10(j) recommendation 3, recommend, that PG&E develop and implement a Feeder Creek diversion facility removal plan in consultation with the resource agencies to address the removal of project diversions on Stevens Creek, Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine creeks. Developing and implementing this plan would ensure specific methods of removing these diversion dams are established that would minimize instream disturbance and any ground disturbing activity, and ensure proper mitigation measures are in place to address sedimentation and any other associated negative effects upon water quality. Further, providing notification to Cal Fish & Game, as recommended by Cal Fish & Game in 10(j) recommendation 9, prior to ground disturbance would allow for agencies to be kept informed of any demolition activities which may affect resources in the project area.

As discussed above, the FWS in 10(j) recommendation 2.6, recommend a minimum instream flow to be released to Little Butte Creek downstream of the feeder diversion and are not recommending it be removed as part of its recommended Feeder Creek diversion facility removal plan. Because this diversion dam has not been used in many years, PG&E is proposing for it to be removed. Therefore, including Little Butte Creek in the Feeder Creek diversion facility removal plan would also ensure any potential water quality impacts associated with its removal were minimized.

*Water Temperature*

DeSabla Forebay – PG&E proposes to develop in consultation with NMFS, Cal Fish & Game, and FWS, a DeSabla forebay water temperature improvement plan based on the results of its feasibility study regarding the potential for reducing thermal loading in DeSabla forebay. PG&E proposes that at a minimum, the plan would include a preliminary design of the proposed facility and a schedule for final design, permitting, and construction of the new facility.

PG&E's proposal is consistent with recommendations submitted by the agencies, including: FWS 10(j) recommendation 5, NMFS 10(j) recommendation 4, Forest Service preliminary 10(a) recommendation 5, Cal Fish & Game 10(j) recommendation 3, and the Conservation Groups recommendation 6. However, these agencies further recommended that PG&E consult with the Water Board and that the plan address reducing thermal loading within DeSabla forebay by 80 percent or greater, which the agencies state is equivalent to limiting the warming within the forebay to ≤0.2ºC.

Cal Fish & Game also recommends in 10(j) recommendation 3 that the plan be developed in consultation with the Forest Service and that the heat gain be measured as the change in temperature between Toadtown canal upstream of DeSabla forebay and DeSabla powerhouse. Cal Fish & Game further recommends that after construction of the physical modification is complete, continued temperature monitoring shall be conducted in Butte Creek at the following locations: Butte Creek upstream of DeSabla powerhouse, Butte Creek at Lower Centerville diversion dam, Butte Creek at Pool 4, Butte Creek upstream of Centerville powerhouse, and Butte Creek downstream of Centerville powerhouse. After 2 years of monitoring, Cal Fish & Game recommends that PG&E report the results of temperature monitoring to the resource agencies, and other interested parties. If the expected temperature benefits have been realized in Butte Creek, resource agencies shall determine whether it is feasible to go forward with flow increases in the West Branch Feather River and/or in Butte Creek. After 5 years of temperature monitoring, Cal Fish & Game and other resource agencies will determine the need for continued comprehensive temperature monitoring in lower Butte Creek.

In response to the agencies recommendations to reduce thermal loading by 80 percent or greater, PG&E stated conceptual engineering indicates certain structures could be constructed which would achieve a reduction in thermal loading by this amount; however, PG&E stated they can not guarantee reductions by 80 percent or greater due to numerous factors which they have no control over, including air temperature, wind speed, flow, resistance time (PG&E, 2008a). PG&E also stated that if the facility achieved an 80 percent reduction in temperature this would result in a 0.46 ºC reduction in warming through the forebay, and would not meet the $\leq 0.2$ °C criteria recommenced by the agencies, which PG&E states would necessitate a 91 percent reduction in thermal loading to achieve this criterion recommended by the agencies. Therefore, PG&E stated they are opposed to having an improvement plan that contains specific targets that must be met by the facility.

In comment letters on the draft EA, the Water Board, Forest Service, FWS, NMFS and Cal Fish & Game stated that they believe thermal loading within DeSabla forebay should be reduced as much as possible, while meeting the operational needs of the forebay. The Water Board, Forest Service, FWS, and Cal Fish & Game recommend that the greatest reduction in thermal loading within the forebay could be accomplished utilizing a pipe, connecting the terminus of Butte canal to the DeSabla powerhouse intake, and that this replaces their preliminary recommendations. Consistent with these comments, the Forest Service in modified 10(a) recommendation 5 recommends PG&E develop a draft DeSabla forebay water temperature improvement plan in consultation with the FWS, NMFS, Cal Fish & Game, and the Water Board to include preliminary designs, a schedule for final design, permitting, and construction of a pipe. FWS also modified its 10(j) recommendation 5 to reflect the construction of this pipe. The Water Board also stated in its February 26, 2009, comment letter that the development of a temperature reduction device can not be deferred until after license issuance. During the

April 13, 2009, section 10(j) meeting, PG&E confirmed they also now propose to install a pipe to reduce thermal loading within the forebay.

*Our Analysis*

DeSabla forebay is a regulating facility for DeSabla powerhouse, which receives flows diverted from upper Butte Creek via the Butte Creek diversion dam and canal, from the West Branch Feather River via the Hendricks diversion dam and canal, and from several small feeder creeks that are diverted into both of these canals, ultimately discharging into DeSabla forebay via the Butte canal. Because flows to the DeSabla powerhouse originate in the forebay, forebay water temperatures affect lower Butte Creek instream water temperatures once flows are discharged from the DeSabla powerhouse. As a result of the increased surface area of DeSabla forebay compared to the project canals and the increased residence time of water within the forebay itself, this creates conditions conducive to temperature warming, which in turn affects water temperatures in lower Butte Creek.

Under existing conditions, typical flows through DeSabla forebay range from between 50 to 200 cfs, with residence times of 6 to 24 hours. PG&E's water temperature studies indicate this equates to a temperature increase of 0.7°C at 200 cfs to 2°C at 50 cfs. During the July through August time period, daily average water temperatures in Butte canal upstream of DeSabla forebay ranged from 12.7 to 17.8°C, compared to water temperatures of 13.9 to 19.0°C downstream at DeSabla powerhouse. These results indicate that water temperatures increase on average approximately 1.1°C passing through the DeSabla forebay during the July through August period.

PG&E conducted a feasibility study evaluating 11 options designed to reduce the residence time, and therefore temperatures in DeSabla forebay.[50] The objective of this study was to reduce water temperature increases in the forebay by 50 percent during the months of July and August, consistent with the terms and conditions of NMFS' preliminary biological opinion. Study results indicate that the high level of mixing between the cold inflows from Butte canal and the warmer water in the forebay (entrained flow of 110 to 160 percent) are mainly responsible for the temperature increases and that a 50 percent reduction in temperature change would require a large reduction in the mixing, with an entrainment in the 5 to 10 percent range. Study results also indicated that a number of options may exist for reducing heating in DeSabla forebay by 50 percent or more, each with separate operational, environmental, and cost factors.

[50] More specific details about the options evaluated for reducing water temperatures within DeSabla forebay are discussed in PG&E's Updated Study Results and License Application Sections filed on February 19, 2008 (PG&E, 2008a).

As discussed in the draft EA, the resource agencies preliminary recommendations recommended that PG&E construct and operate a DeSabla forebay temperature reduction device that reduced thermal loading within the forebay by at least 80 percent. However, in comment letters received by the agencies on the draft EA and in clarifying information provided during the April 14, 2009, section 10(j) meeting, Cal Fish & Game, NMFS, FWS, and the Forest Service modified their recommendation, and PG&E modified its proposal, for the construction and operation of a pipe to connect the terminus of Butte canal to the DeSabla intake to reduce thermal loading.

Utilizing a pipe to transport water from Butte canal to the DeSabla intake would reduce thermal loading to the greatest extent possible since water from Butte canal would not enter the forebay itself, but rather conduct water directly to the DeSabla powerhouse intake. Employing this design would eliminate the thermal loading associated with other designs that would subject the canal water to mixing with the warmer forebay water. Such a design would also eliminate uncertainty associated with PG&E attempting to comply with reducing thermal loading based on certain percentages, as contained in preliminary agency recommendations. However, during the section 10(j) meeting, the agencies stated that operation of such a facility would likely reduce thermal loading by at least 80 percent.

Developing, in consultation with the Forest Service, NMFS, FWS, Cal Fish & Game, and the Water Board, a draft DeSabla forebay water temperature improvement plan, as recommended by the agencies, would allow for PG&E to work with the resource agencies to further discuss the details of such a facility, including potential design and operational options to achieve the greatest reduction in thermal loading possible. Any potential measures to minimize negative impacts to water quality within the forebay during construction, such as sedimentation and erosion control measures, would also need to be addressed via this plan. However, in PG&E's Study on the Reduction of Heating in DeSabla forebay, PG&E provided some details regarding such a facility, although it is likely the design of this facility will be modified as consultation with the agencies occurs. Preliminary designs included in this initial study indicated that a 6 foot-in-diameter pipe, approximately 1,300 feet long, would be needed, with the pipe embedded into the pond bottom in the upper reaches of the forebay. A small weir just below the intake spillway would be constructed to provide the required head (approximately 4 feet), allowing surges in the pipe to spill into the forebay. Lastly, an open connection between the pipe and the intake structure would allow positive surges in the pipe to spill into the forebay and allow forebay water to supply transient needs for the hydropower system.

Upon implementation of this plan, water discharged from DeSabla forebay would be reduced in temperature compared to existing conditions, and as a result decrease water temperatures within lower Butte Creek. Reducing water temperatures during the summer months would be beneficial for spring-run Chinook salmon and likely reduce summer

mortality rates of salmon holding downstream of lower Centerville diversion dam and Centerville powerhouse by enhancing thermal habitat and increasing summer holding habitat. In contrast, operating this pipe would likely result in warmer water temperatures within the forebay, compared to current conditions and may also result in stagnation or the drying of the forebay as a result of the loss of inflow. As a result, warmer water temperatures within the forebay have the potential to have negative impacts on the current recreational trout fishery and aesthetics. We further discuss the impacts of operating this pipe on the recreational fishery in sections 3.3.5 and 3.3.6, *Recreation Resources* and *Land Use and Aesthetics*, respectively.

PG&E provided a variety of W2 water temperature simulations comparing base case and simulations from June 19 to August 8 using the 2005 calibrated model (above normal hydrology, hot meteorology) and the 2001 hydrology (dry hydrology) and 2005 meteorology (hot meteorology). Appendix B; tables 1 and 2 illustrate the downstream effects of a 50 versus 80 percent reduction in thermal loading within DeSabla forebay in lower Butte Creek. Various simulations also take into account PG&E's proposed, Forest Service specified, and agency recommended minimum instream flows downstream of various diversion dams. This table illustrates that engineered solutions to reduce heating in the DeSabla forebay have a direct impact on water temperature throughout lower Butte Creek and that it does so without the need for additional flow from the West Branch Feather River, providing additional flexibility in operating the system. We discuss in detail the water temperatures in lower Butte Creek as a result of reducing thermal loading within the forebay by at least 80 percent and implementing the various agency proposed and PG&E recommended minimum instream flows in the *West Branch Feather River-Downstream of Hendricks Diversion Dam* section, above.

Upon construction of a water temperature improvement facility, continued temperature monitoring in Butte Creek, as recommended by Cal Fish & Game, would help to determine the extent of temperature reductions as a result of reducing thermal loading within the forebay. Additionally, monitoring water temperatures within the forebay itself would allow for an assessment of the degree of water temperature increases that would result by essentially bypassing water around the forebay. These results would likely assist in determining how best to manage the recreational fishery present in the forebay. Providing these results to the resource agencies, and other interested parties, would also allow for this data to be distributed and analyzed by others. However, Cal Fish & Game's further recommendation to determine the need for continued comprehensive temperature monitoring in lower Butte Creek after 5 years would be unlikely to provide any additional data on the effects of reducing thermal loading in the forebay and the resulting downstream water temperatures.

*Water Temperature Monitoring*

FWS in 10(j) recommendation 16 and NMFS in 10(j) recommendation 5 recommend that PG&E develop and implement a water temperature monitoring plan in

consultation with FWS, NMFS, Cal Fish & Game, the Water Board, and the Commission. These agencies recommend that this plan be incorporated as part of their recommended long-term project operations plan, as discussed below, and be consistent with water temperature monitoring recommended in FWS 10(j) recommendation 6 (Fish Monitoring Plans) and FWS 10(j) recommendation 7 (Herpetofauna Monitoring), and NMFS 10(j) recommendation 5 (Fish Monitoring Plans) and 10(a) recommendation 1. They further recommend the plan: (1) monitor thalweg water temperature in the project-affected stream reaches and that PG&E provide results of water temperature monitoring to the resource agencies in a technical report prior to an annual consultation meeting; and (2) include a comparison of the results with those of the previous years and a discussion of the implications of the water temperature effects of diversion to Butte Creek through the Hendricks canal diversion. The plan would be based on the previous year's Project Operations Plan's water temperature monitoring sites, methods, and reporting. These recommendations are consistent with Forest Service modified 4(e) condition 20.

We further discuss temperature monitoring as it relates to foothill yellow-legged frogs below in section 3.3.3, *Terrestrial Resources*.

*Our Analysis*

Water temperatures in the project area are of critical importance to a variety of aquatic species in project -affected stream reaches. Currently, PG&E operates the project based upon an annual Project Operations and Maintenance Plan that is developed each spring in consultation with resource agencies with the goal of operating the project such that water temperatures are reduced in lower Butte Creek during the hottest times of year for the benefit of federally listed spring-run Chinook salmon. Modifications to minimum instream flows in project-affected stream reaches, reductions of water temperatures in Lower Butte Creek as a result of implementing the proposed DeSabla forebay water temperature improvement plan, and implementing PG&E's annual Project Operations and Maintenance Plan, all have the potential to separately and cumulatively reduce instream water temperatures in the project area. Developing and implementing a water temperature monitoring plan as part of a long-term operations plan, and as recommended by the agencies, would allow for this information to compiled, allowing for any temperature data to be analyzed in conjunction with project operations, and help to quantify the results of mitigation measures designed to reduce instream temperatures in lower Butte Creek. Water temperature monitoring would be especially important during adverse weather conditions such as drought and/or extreme periods of hot weather which can have negative effects upon aquatic species. Also, water temperature monitoring could provide valuable information on the biological response of spring-run Chinook salmon in lower Butte Creek as a result of implementation of new license conditions.

Providing the results of temperature monitoring prior to an annual consultation meeting would likely become a basis for any discussions between PG&E and the

agencies regarding potential proposals to adaptively manage and modify project operations, or facilities, in an effort to provide more ideal habitat conditions for aquatic resources. Further, it would be prudent to consider all monitoring information, not just temperature, gathered as a result of new license conditions when evaluating modifications to project operations or facilities, as recommended by Cal Fish & Game. However, any proposals to modify project operations or facilities as a result of this information would need to be approved by the Commission prior to implementation.

Further, comparing the temperature data to that from previous years, and a discussion of the implications of the water temperature effects of diversion to Butte Creek through the Hendricks canal diversion would allow for a thorough analysis of potential water temperature trends over time and assist with developing any needed changes to project operations which may useful in further reducing water temperatures in lower Butte Creek. This would likely be most efficiently accomplished by including any temperature monitoring as part of a long-term operations plan, as further specified by the Forest Service, and as recommended by the agencies. Further, basing the plan on the previous year's Project Operations Plan's water temperature monitoring sites, methods, and reporting would ensure sampling sites and methodologies are consistent from year-to-year and ensure results would be comparable over time for purposes of analysis.

**Fishery Resources**

*Stream Diversions, Fish Entrainment, and Passage*

Stream flow diversion and reservoir operations affect aquatic biota in Butte Creek, the West Branch Feather River, 12 feeder tributaries (see table 3-16 and figure 1-2), and five project canals (Butte, Toadtown, Hendricks, and Upper and Lower Centerville).

The diversion of stream flow into project canals results in the well documented entrainment of fish into the project's canal system.[51] Some of these fish may become entrained into project intakes. Entrainment of fish into hydroelectric project intakes typically causes injury or mortality to a portion of the fish, with mortality rates tending to be lower for smaller fish and higher for turbines that operate under higher levels of head, with higher rotational speeds, and with smaller passageways (Cook et al., 1997; Franke et. al., 1997; Winchelle et. al., 2000). Although PG&E evaluated the level of entrainment in to project canals, the Forest Service's 10(a) recommendation 21 provides for PG&E to conduct a fish entrainment study to quantify the number of fish being entrained there.

As a result of its licensing studies, PG&E proposes to develop a project canal fish rescue plan, as recommended by FWS in its 10(j) recommendation 14, and consistent

[51] PG&E, in its final license application, estimates at least 3,000 trout (rainbow and brown trout) are entrained into the project's canal system annually.

with PG&E's current fish rescue activities. Proposed measure would include: (1) definition of activities that would trigger canal fish rescue efforts; (2) prior notification and coordination with Cal Fish & Game; (3) fish rescue methods including counting fish and placement of fish in active streams; and (4) providing a letter summary of fish rescue activities to Cal Fish & Game. This plan is consistent with NMFS' 10(j) recommendation 9, and the Forest Service's 10(a) recommendation 14, except that NMFS and the Forest Service also recommend fish rescues twice annually. Cal Fish & Game [10(j) recommendation 12], also recommends that fish rescues be conducted until such time that fish screens are installed to prevent entrainment into the canals.

In comments on the final license application, NMFS, Cal Fish & Game, and FWS each filed 10(j) recommendation for screening of various canal intakes; these recommendations are consistent with the Forest Service's, the Conservation Groups and CSSA's 10(a) recommendations for fish screens.[52] The location of the recommended fish ladders and screens are identified in table 3-28.

Project diversion dams also result in a loss of habitat connectivity preventing upstream migration of fish from downstream habitats into habitats upstream of the diversions for foraging, rearing and spawning activities; thereby, also preventing the upstream movement of genetic material from fish populations below the diversion structures to upstream populations. This is also the case with the project's 12 feeder diversions. The Cal Fish & Game, FWS, Forest Service, [53] and the Conservation Groups recommend that a fish ladder be installed at the Hendricks diversion dam to improve the habitat connectivity in the West Branch Feather River. The Forest Service in its 10(a) recommendation 23 specifies PG&E should conduct a fish migration study, to determine if the Hendricks diversion dam is an impediment to fish movement in the West Branch Feather River. Under the Conservation Groups and CSSA recommendations, the Centerville development may be decommissioned including the removal of the Lower Centerville diversion dam and canal.[54]

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[52] The Forest Service's 10(a) recommendation 22 provides that if the Hendricks Canal Fish Entrainment Study, and the results of the trout monitoring plan [Forest Service 4(e) condition 19] do not meet its resource management objectives outlined in its 10(a) recommendation 21 and its 4(e) condition 19 (830 rainbow trout per acre), PG&E would construct a fish exclusion facility (fish screen) at the Hendricks Canal.

[53] The Forest Service's 10(a) recommendation 24 provides that if the Hendricks is found to be a impediment to fish movement in the West Branch Feather River as a result of the Fish Migration Study [Forest Service 10(a) recommendation 23], PG&E would construct a fish passage facility (fish ladder) at the Hendricks diversion dam.

[54] In its comments on the draft EA, the Conservation Groups state that they do not propose dam removal as an alternative.

Table 3-28. Recommended fish passage and intake screen locations and criterion. (Source: Staff)

| Location | Requester | Criterion |
|---|---|---|
| **Fish Screen Recommendations** | | |
| Hendricks Canal Entrance | Cal Fish & Game, CSSA, Conservation Groups, FWS, Forest Service | Meet Cal Fish & Game's criteria for rainbow trout fry; Screen shall be automatically cleaned; Screen shall incorporate sediment sluice back to the West Branch Feather River. |
| Lower Centerville Canal Entrance | NMFS, U.S. Forest Service, CSSA, Conservation Groups, FWS | NMFS Criteria for Anadromous Salmonids & Cal Fish & Game's criteria for rainbow trout fry |
| Butte Creek Canal Entrance | CSSA | |
| **Fish Ladder Recommendations** | | |
| Hendricks diversion dam[a] | Cal Fish & Game, FWS, Conservation Groups, Forest Service | FWS – Specifies that a fish ladder be installed to allow for passage of all life stages of trout. Cal Fish & Game specifies that the fish ladder provide adult rainbow trout passage from March 1, through October 31. |

[a] While FWS does not specify an operational window; the Cal Fish & Game recommends that the fish ladder be operated from March 1 to October 31 each year. During the 10(j) / 4(e) teleconference held on May 18, 2009, Forest Service stated that a fish ladder on Hendricks should be operational during all water year types.

NMFS recommends a fish screen at the Lower Centerville diversion because it finds that resident rainbow trout population upstream of the diversion dam, have the potential to produce offspring that exhibit a marine life history and thereby they may be important to the recovery of the Central Valley steelhead. Providing a screen at the

Lower Centerville diversion would prevent these fish that may exhibit a marine life history from being entrained into project works during their downstream migration to sea.

PG&E in its reply comments filed on August 14, 2008, states that the need for fish screens or ladders at the Butte Creek, Hendricks, and Lower Centerville diversion dams is unsupported. PG&E does; however, propose to remove the diversion structures from five of the 12 feeder diversions (Stevens and Little Butte creeks, Oro Fino, Emma, and Coal Claim ravines).[55] Cal Fish & Game's 10(j) recommendation 9 and consistent also recommends the removal of these five feeder diversions. PG&E's proposal is also consistent with the Forest Service's 10(a) recommendation 3 and the FWS' 10(j) recommendation 3 to remove the five feeder diversions. PG&E does not support the decommissioning of the Centerville powerhouse and subsequent removal of the Lower Centerville diversion dam as may result from the Conservation Groups recommendation.

*Our Analysis*

Fish Entrainment and Passage – Relicensing studies found that fish are entrained in to project canals as a result of project operations (see tables 3-19, 3-20, and 3-21). As a result we do not find that additional entrainment study within the Hendricks canal, as recommended by the Forest Service, is warranted.

PG&E's proposal to continue the implementation of fish rescues from project canals would limit the projects effects on the fish populations in the project stream reaches. However, do to the infrequency of the fish rescues, it is likely that some of the fish that become entrained into the project's canal system would also be entrained into project intakes before a fish rescue occurs; thereby resulting in the injury or mortality.

Screening of the diversion intakes as specified by the resource agencies at the Hendricks diversion dam and the Lower Centerville diversion dam would limit the entrainment of fish into the projects canal system from the West Branch Feather River and Butte Creek. As a result, the number of fish that are likely injured or fatally wounded as a result their entrainment in to project intakes would decline. We note however, that fish will continue to be diverted into the project's canal system at the Butte Creek diversion dam and each of the operating feeder diversions.

Screening the Lower Centerville diversion dam may also prevent the entrainment of juvenile rainbow trout that may be migrating seaward. However, based on historical references in the Pre-Application Document and limited flows in the recent years prior to the surveys, the Lower Centerville diversion dam is assumed to be the upstream-most point of anadromy on Butte Creek; however, adult steelhead were observed a short

[55] The five feeder diversions have not been utilized by the project in approximately 11 years.

distance downstream of the diversion in Quartz Bowl (near RM 60) during the 2006 fish survey. While the Lower Centerville diversion is assumed to be a barrier we recognize that steelhead passage beyond quartz bowl and into the stream reach above Lower Centerville diversion dam may be possible under perfect and/or historic conditions. However, because only 0.58-mile of additional Butte Creek habitat, upstream of the Lower Centerville diversion dam may have been accessible to returning adult steelhead it is unlikely that a significant percentage of juvenile rainbow trout residing within the Butte Creek stream reach between the Butte Creek diversion dam and Lower Centerville diversion dam are progeny of steelhead and exhibiting an anadromous life history.

The diversion structures continue to block the natural upstream movements of fish throughout the project-affected stream reaches. As a result, it is unclear why the Forest Service recommends a fish migration study to demonstrate this fact.

The installation of a fish ladder on the Hendricks diversion dam would allow for the connectivity of the West Branch Feather River's habitat from the downstream Miocene diversion (non-project facility) upstream to the headwaters of the West Brach Feather River. This connectivity would support natural behavioral movements of the native trout population for foraging, rearing and spawning.

Feeder Diversions – PG&E proposes removal of five feeder diversions because they have been discontinued for more than 10 years and are no longer serving a project purpose. Although no specific fish surveys were conducted in these feeder tributaries, they were surveyed as part of Study 6.3.3-11, Canal Feeder Stream Study Plan. As a result of the habitat surveys conducted we find that each of these tributaries is likely to support fish populations above and below the diversion structures and that removing the five feeder diversion as proposed would reestablish the habitat connectivity within the tributary streams and within Butte Creek.

Lower Centerville Diversion Dam Removal – Removal of the Lower Centerville diversion dam, as recommended by the Conservation Groups and CSSA, would eliminate the need for PG&E's proposed project canal fish rescue plan or a fish screen at the entrance to the Lower Centerville canal. While removing this structure would open up a small amount of fish habitat below a large 35-foot-high natural barrier to upstream fish passage that exist 0.58-mile upstream of the diversion dam, it would also prevent the delivery of cold water to lower Butte Creek below the Centerville powerhouse.

As discussed below, PG&E proposes and the agencies recommend a DeSabla forebay temperature reduction device (i.e. pipe) be constructed within the forebay. As discussed in section 3.3.2.2, *Aquatic Resources*, with the installation of this pipe, as compared to current conditions, PG&E's temperature modeling indicates that if all the flow from DeSabla powerhouse remained in the channel, as would occur if the Lower Centerville diversion dam were to be removed, the resulting in-channel water temperature

downstream of the Centerville tailrace would be marginally cooler (appendix B; tables 1 & 2). However, while the water temperature downstream of the Centerville tailrace would be cooler, under this scenario, it would likely have significantly warmed as it flows from the DeSabla tailrace through the Butte Creek channel. Therefore, because the coldest water within the stream channel would be located at the DeSabla powerhouse tailrace, it is likely that salmonids, in particular the ESA-listed anadromous fish, would move upstream above Centerville powerhouse in search of the colder water released from the DeSabla tailrace. This could exacerbate the already crowded conditions within the stream reach between the DeSabla tailrace (Lower Centerville diversion dam) and the Centerville powerhouse.

Additionally, while the installation of the pipe in DeSabla forebay would likely mitigate for the negative effects on Butte Creek water temperatures that removal of the Lower Centerville diversion would have, the cold water benefits of installing the pipe and operating the Centerville development, as discussed above, would allow for even greater cold water distribution than under current condition or with the Lower Centerville diversion removed.

It is clear that the project is preventing the upstream migration of fish past project diversions and the entrainment of fish into project canals is likely affecting the density of the trout populations in project-affected stream reaches. However, results reported in the study reports for study 6.3.3-4 Characterize Fish Populations in Project Reservoirs and Project-Affected Stream Reaches and study 6.3.3-6 Assessment of Fish Entrainment and Upstream Fish passage Issues at DeSabla Centerville Project Facilities and in PG&E's Updated Fish Population Study Results filed in December 2007, generally demonstrate that age class structure of the trout populations within project-affected stream reaches is sufficient to demonstrate viable fish populations. While Cal Fish & Game and the other resource agencies, in their comments on the draft EA stated that there is too little data available for Commission staff to make the above determination, we note that the Cal Fish & Game omitted the 2007 Updated Fish Population Data Study Results, when providing its comments on the draft EA.

When omitting the 2007 data, it would appear that fish populations with in project affected stream reaches have been on a declining trend for 20 to 30 years, as argued by the Cal Fish & Game. However, upon a review of the updated data, inclusive of the 2007 data sets, it is apparent that the population data for the West Branch Feather River demonstrates a demonstrating the range of variability in the trout population, with mean trout densities of about 320 trout per 100 meters with a standard deviation of 268.1. Population surveys conducted on Butte Creek in 1986 and 2007 are only marginally different, with each being greater than the population estimates of 2006. This demonstrates a range in the variability in the trout populations vs. a declining trend.

The condition of trout sampled from the project's canal system is good, with rainbow trout and brown trout having a mean condition factor of 1.17 and 1.05-1.14, respectively.[56] Further, PG&E's updated 2007 data, in which PG&E provided condition factors for fish sampled in Butte Creek and the West Branch Feather River, demonstrates that rainbow trout had an average condition factor of 1.04 in sampled stream reaches and brown trout an average condition factor of 1.10 and 0.92,[57] in the West Branch Feather River and Butte Creek, respectively. Additionally, species composition in project affected stream reaches, sampled in 2006, was similar to historical observations (see table 3-17). Therefore, we find that trout populations within project-affected stream reaches, both above and below the project diversions are viable.[58]

We discuss the cost of developing and implementing measures relating to entrainment and fish passage in section 4, *Developmental Analysis*. We present our final recommendations pertaining to entrainment and fish passage in section 5, *Conclusions and Recommendations*.

*Aquatic Monitoring*

PG&E does not propose to monitor the fishery resource within the projected affected stream reaches during the term of a new license. However, the Forest Service condition 19 would require the development and implementation of a rainbow trout population monitoring plan for the West Branch Feather River. As discussed below, the Forest Service, NMFS, FWS and Cal Fish & Game also recommend the development and implementation of an aquatic biological monitoring plan. The aquatic biological monitoring plan is made of three components a fish monitoring plan for monitoring resident and anadromous fish, amphibian monitoring plan, and a benthic macroinvertebrate monitoring plan.

Forest Service 4(e) Condition 19, Trout Population Monitoring – The Forest Service's 4(e) condition 19 would require the development and implementation of a West Branch Feather River rainbow trout population monitoring study. Implementation of the

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[56] We recognize that these fish were sampled from the project's canal system and not the project-affected stream reaches; however, because the habitat within the canals are inferior to the habitat provided in the natural stream reaches using the condition factors of fish captured from the canals should prove to be conservative value over the condition factors of fish from project affected stream reaches.

[57] Only one brown trout was sampled in Butte Creek.

[58] In its' filings with the Commission on June 27, 2008, FWS and the Forest Service, respectively, concurred with this finding. However, during the April 13, 2009, 10(j) meeting the agencies rescinded their concurrence.

study would be for a minimum 6 year period of time,[59] in the 3 miles of stream reach above and below the Hendricks diversion dam.

The Forest Service specifies that the threshold for determining whether additional studies or fish protection measures will be needed to mitigate for impacts associated with the Hendricks diversion dam will be based on statistical comparisons of rainbow trout populations upstream and downstream of the dam as well as statistical comparison to rainbow trout populations in three to five selected Sierra Nevada streams and that condition factors will also be recorded for fish sampled at each site. Statistical measures will be used to determine: (1) if the rainbow trout populations upstream and downstream of the diversion are statistically comparable to the comparison streams, (2) if the density of rainbow trout upstream and downstream of the diversion are statistically equivalent, and (3) if the Fulton Condition Factor of rainbow trout upstream and downstream of the diversion are statistically equivalent. The Forest Service specifies that an average Fulton Condition Factor of 1.2 (Barnham & Baxter, 1998) shall be the used as the threshold condition factor.

Following completion of the study, PG&E would develop and implement part 2 of the Forest Service's condition 19, the rainbow trout habitat and population improvement plan. This plan would require the development and implementation of unspecified measures to improve the rainbow trout population above and below the Hendricks diversion dam to levels comparable to those of the selected Sierra Nevada streams.

Forest Service's modified 4(e) condition 19 is largely consistent with PG&E's alternative 4(e) filed on July 30, 2008, in which PG&E includes monitoring the fish populations (not just rainbow trout) within three sample sites, located within approximately 3 miles above and below the Hendricks diversion dam on the West Branch Feather River to support a statistical comparison of water year types and fish populations with a minimum of 3 years of the sampling during dry and normal water years.

*Our Analysis*

Regarding Forest Service's 4(e) condition 19, we find that the Forest Service's recommendation to select between three and five Sierra Nevada streams to be determined by PG&E, the Forest Service and other interested agencies would allow for a selection of streams that best represent the West Branch Feather River as a surrogate to set appropriate target rainbow trout populations for project-affected stream reaches in the West Branch Feather River.

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[59] Three years shall be dry water year types and three years shall be normal water year types.

However, as discussed above, while we acknowledge the project is likely affecting the overall population density of rainbow trout in the West Branch Feather River, we find that the trout populations above and below the Hendricks diversion dam are viable and question the need for the Forest Service's condition 19.

We discuss the cost of developing and implementing the trout monitoring plan section 4, *Developmental Analysis*. We present our final recommendations pertaining to this plan in section 5, *Conclusions and Recommendations*.

Resident Fish Monitoring – The Forest Service 4(e) condition 20 requires that PG&E monitor fish species composition and relative abundance in project-affected bypassed reaches, utilizing the same sampling methods and location used during the relicensing surveys. Table 3-29 lists the monitoring locations. The Forest Service specifies that surveys would be conducted in two successive years, beginning in the fifth full year after implementation of the minimum instream flows required by its 4(e) condition 18, or following completion of the rainbow trout monitoring study prescribed by its 4(e) condition 19, whichever is later. The Forest Service specifies that surveys would be conducted in years 5, 6, 11, 12, 17, 18, 23, 24, 29, and every 5 years thereafter for the life of the license.[60] Forest Service's 4(e) condition 20 is generally consistent with PG&E's alternative 4(e).

Table 3-29. Forest Service 4(e) condition 20 fish monitoring sites. (Source: Forest Service)

| Site No. | Site Description |
|---|---|
| F-2 | Philbrook Creek downstream of Philbrook reservoir |
| 15.1 | West Branch Feather River near the confluence of Rattlesnake Creek |
| 21.2 | West Branch Feather River downstream of Fall Creek |
| 35.6 | West Branch Feather River (8 Amphibian sampling site) |
| 41.1 | West Branch Feather River downstream of Coon Hollow Creek |

FWS and NMFS' 10(j) recommendation 6 and 5, respectively, differ from the Forest Service's 4(e) condition 20, in that they would require the development and implementation of a plan to monitor of resident fish populations in project-affected

[60] Pursuant to the Forest Service's condition, scheduled sampling would not occur during a wet water year and would be postponed until the following normal or dry water year type.

stream reaches within Butte Creek,[61] in addition to the West Branch Feather River as required by the Forest Service, and that surveys be conducted for two consecutive years for every 5-year period for the term of the license, beginning the first of license issuance. However, this is consistent with the Forest Service's 10(a) recommendation 6 as it pertains to Butte Creek. The Cal Fish & Game's 10(j) recommendation 5 is consistent with both NMFS and FWS recommendations and the Forest Service's 10(a) recommendation 6, for resident fish monitoring except that it specifies the development of the monitoring plan be completed within 6 months of license issuance, does not include monitoring of the project's reservoirs, and does not specify a sampling frequency.

In its reply comments filed on August 18, 2008, PG&E contends that because the DeSabla forebay and Philbrook reservoir are stocked by the Cal Fish & Game and managed as put-and-take fisheries and that Round Valley reservoir is typically emptied by late summer, monitoring the fishery in project impoundments, as recommended by the FWS in its 10(j) recommendation 6 and the Forest Service's 10(a) recommendation 6 would not result in added beneficial information.

*Our Analysis*

Fish species composition and abundance would likely respond to changes in project operations, specifically, alteration in minimum flows provided to project bypassed reaches. Habitat enhancement, fish passage at project diversion dams, and screening of project canal intakes could also promote a response in the fishery within affected stream reaches. Monitoring the fishery's response would enable an evaluation of the habitat modification and/or alterations in project operations and provide for future evaluation of any required alteration of minimum flows, and/or habitat enhancements, supporting future habitat enhancements or modifications to project operation or minimum flow, through adaptive management as recommended by the Cal Fish & Game in its 10(j) recommendation 5.

Regarding the timing of the resident fish monitoring, the Forest Service's recommendation to begin monitoring in the fifth full year after implementation of any required changes in the minimum instream flows would allow for the fishery to respond to the new flow regime. Where as the recommendations to develop and implement the resident fish monitoring within 1 year of license issuance (6 months in the case of the Cal Fish & Game's 10(j) recommendation 5) would capture the fishery's response while in it is still in a state of flux, resulting in the information being gathered having little value.

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[61] FWS' recommendation 6 also included fish monitoring in the project's impoundment (DeSabla forebay, Round Valley reservoir, and Philbrook reservoir.

While, monitoring the resident fisheries' response to alteration to the minimum flow provided to a project bypassed reach or following a habitat enhancements for the duration of the project's license as recommended by the agencies, seems excessive; however, the information could inform Cal Fish & Game's recommended adaptive management program if implemented. Additionally, because the fishery is likely to respond within 3 years of a change in project operations, monitoring trout populations beginning in the fifth full year after implementation of the minimum instream flow or the habitat enhancement would capture the response.

Monitoring of the put-and-take fisheries within the DeSabla forebay and Philbrook reservoir would serve little purpose as any population data gathered would be largely reflective of the Cal Fish & Game's management of the put-and-take fishery, numbers of fish stocked and angling pressure. While this information could be used to inform fishery management decisions of the Cal Fish & Game, it would serve little use for informing adaptive management provisions for the project. Also, because Round Valley reservoir is typically drained each year, and the watershed upstream of the reservoir typically goes dry during the summer,[62] we find that surveying the fishery at this location would serve no purpose. Following issuance of the draft EA, the FWS subsequently withdrew this portion of its 10(j) recommendation 6.

We discuss the cost of developing a plan for and implementing resident fish monitoring in section 4, *Developmental Analysis*. We present our final recommendations for resident fish monitoring in section 5, *Conclusions and Recommendations*.

*Anadromous Fish Monitoring*

NMFS and the FWS in their 10(j) recommendation 5(A) and 6(A) respectively, and the Forest Service in its 10(a) recommendation 6(A) provide that PG&E should annually monitor the federally listed spring-run Chinook salmon and the Central Valley steelhead in Butte Creek. NMFS recommends that PG&E develop a plan for the monitoring that includes annual snorkel surveys to monitor adult distribution and abundance, annual pre-spawn mortality surveys, and annual carcass surveys to monitor spawning. The plan as recommended would also provide for the consideration of juvenile emergence and outmigration monitoring in extreme dry years. The plan would also consider modifications to facility operations and maintenance necessary to avoid, minimize or improve project related impacts to Chinook salmon and steelhead. While consistent with the above recommendations by NMFS and FWS, Cal Fish & Game's 10(j) recommendation 6 would also include monitoring of movement patterns of adult

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[62] See Study Report 6.3.3-4, *Characterization of Fish Population in Project Reservoirs and Project-Affected Stream Reaches*.

Chinook salmon in response to any flow changes, and the monitoring of Chinook holding habitat and spawning gravels.

The Conservation Groups' 10(a) recommendation 1(c) also provides for monitoring of Chinook salmon including monitoring of their migration, holding, and spawning. However, the Conservation Groups propose that the jurisdictional resource agencies[63] install a removable weir to limit upstream migration of Chinook salmon and enable the monitoring. The Conservation Groups state that the specific task of the monitoring would be to set a default protocol for the weir's installation and removal, for the better management of Chinook salmon habitat and spawning.

PG&E in its reply comments state that they will develop a plan to monitor federally listed anadromous salmonids in consultation with the resource agencies. However, PG&E does not commit to monitoring the additional measures provided by the Cal Fish & Game to monitor the movement patterns of adult Chinook salmon, and Chinook holding habitat and spawning gravels, stating that they need further clarification on these monitoring recommendations. PG&E does not support the Conservation Groups' recommendation for the installation of a weir as this recommendation is part of the Conservations Groups larger recommendation which may result in the decommissioning of the Centerville powerhouse as discussed in section 2, *Proposed Action and Alternatives*.

*Our Analysis*

The federally listed status of the anadromous fishery in lower Butter Creek and its dependence on the DeSabla-Centerville Hydroelectric Project's operations and the inter-basin transfer of flows from the West Branch Feather River warrants annual monitoring of the this fishery and its response to project operations. Annually monitoring the behavioral changes of the federally listed fish to changes in project operations resulting from adaptive management provisions of any license issued, and the resultant changes in habitat will allow PG&E and the resource agencies to adaptively manage project operations, throughout the term of the license, to ensure the effective protection of spring-run Chinook salmon and Central Valley-run steelhead trout in lower Butte Creek. Information resulting from the monitoring would likely generate a library of information to be used to inform the long-term project operations plan (discussed below) and its annual implementation to protect the listed species as well as to evaluate future habitat enhancements or modifications to project operation or minimum flows, through the adaptive management provisions recommended by Cal Fish & Game in it 10(j) recommendation 5.

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[63] We assume the Conservation Groups are referring to NMFS and Cal Fish & Game.

*Benthic Macroinvertebrate Monitoring*

Forest Service 4(e) condition 20 and 10(a) recommendation 8, NMFS' and FWS' 10(j) recommendation 6 and 8, respectively, provide for the development and implementation of a benthic macroinvertebrate monitoring plan. The NMFS and FWS recommended plan would include sampling to be conducted within project bypassed reaches in years 1 through 4, and in years 8, 12, 16, 20, 24, and every 5 years thereafter. The Forest Service in its modified 4(e) conditions provides for monitoring during years 1, 2, 5, 6, 11, 12, 17, 18, 23, 24, and every 5 years thereafter for the term of the license. The monitoring plan would include provisions for monitoring species composition and relative abundance and that PG&E will use the data to determine trends in the macroinvertebrate community structure, as represented by matrix (e.g., taxa, richness, EPT index, and tolerance value), in the California Stream Biomass Procedure, and provide a comparison of trends in metrics within reaches, between reaches, and a comparison with previous results.

PG&E in its reply comments and alternative 4(e), provides an alternative sampling frequency to the agencies' sampling frequency. PG&E stipulates that surveys should be conducted in years 1, 3, 5, 11, 17, 23, 29 and every 5 years thereafter through the term of the license and in coordination with PG&E's alternative 4(e) condition 20 for the fish population monitoring.[64] Also, PG&E's alternative would adopt the bioassessment sampling methodology outlined in the California Statewide Ambient Monitoring Program, which replaced the California Stream Biomass Procedures as California's standard methodology for collecting aquatic macroinvertebrates for bioassessment.

*Our Analysis*

Benthic macroinvertebrate monitoring would assist with determining the effectiveness of measures implemented in the new license for enhancing trout populations, and for assessing whether any modifications or additional measures are needed. Sampling benthic macroinvertebrates in the same years as fish population monitoring would help identify relationships between fish populations and the abundance of the aquatic macroinvertebrate prey base, which would improve understanding of the relationship between measures that are implemented and aquatic productivity.

Additionally, like with the resident fish population monitoring, monitoring the benthic macroinvertebrates response to alteration in project operations for the duration of the project's license as recommended by the agencies, seems excessive; however, this

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[64] The Forest Service's modified 4(e) condition for benthic macroinvertebrate monitoring frequency is consistent with its condition for resident fish population monitoring and the monitoring frequency identified there.

information too could inform Cal Fish & Game's recommended adaptive management program if implemented. The benthic community would respond quickly to an alteration to project operations or facilities that would have an influence on benthic macroinvertebrate populations.

Utilizing the most recent state standard methodology to conduct the monitoring would be appropriate. However, we recognize that the relicensing study 6.3.3-5 Survey Benthic Macroinvertebrates in Project-Affected Stream Reaches using California Stream Bioassessment Protocol used the former state standard and is consistent with the agencies' recommendations. For consistency between study data, pre-licensing and post-licensing, it may be appropriate to remain consistent in the methodology.

*Annual Consultation, Long-term Operations, and Adaptive Management*

Annual Consultation Meeting – The Forest Service's 4(e) condition 1 requires PG&E to annually meet with the Forest Service to consult on measures needed to ensure protection and utilization of the National Forest resources affected by the project. As required by the Forest Service, consultation would include but not be limited to:

- A status report regarding implementation of license conditions;
- Results of any monitoring studies performed over the previous year in formats agreed to by the Forest Service and South Feather during development of study plans;
- Review of any non-routine maintenance;
- Discussion of any foreseeable changes to project facilities or features;
- Discussion of any necessary revisions or modifications to plans approved as part of this license;
- Discussion of needed protection measures for species newly listed as threatened, endangered, or sensitive or, changes to existing management plans that may no longer be warranted due to delisting of species or, to incorporate new knowledge about a species requiring protection; and
- Discussion of elements of current year maintenance plans, such as for road maintenance.

PG&E would keep a record of the meeting, which would include any recommendations made by the Forest Service for the protection of National Forest lands and resources. PG&E would file the meeting record, if requested, with the Commission no later than 60 days following the meeting. A copy of the certified record for the

previous water year regarding instream flow, monitoring reports, and other pertinent records would be provided to the Forest Service at least 10 days prior to the meeting date, unless otherwise agreed. Copies of other reports related to project safety and non-compliance would be submitted to the Forest Service concurrently with submittal to the Commission. These would include, but are not limited to: any non-compliance report filed by PG&E, geologic or seismic reports, and structural safety reports for facilities located on or affecting Forest Service lands. Subject to any restrictions contained in any agreement with PG&E, the Forest Service reserves the right, after notice and opportunity for comment, to require changes in the project and its operation through revision of the section 4(e) conditions to accomplish protection and utilization of National Forest lands and resources.

Long-term Operations Plan – PG&E proposes to develop in consultation with NMFS, Cal Fish & Game, and FWS, and implement upon Commission approval, a long-term operations plan. PG&E proposes the plan would be implemented for the duration of any new license issued with the primary goal of seeking to provide cold water for holding, spawning, and rearing spring-run Chinook salmon and steelhead in Butte Creek upstream and downstream from the Centerville powerhouse. PG&E proposes the plan would consider the feasibility of increasing spawning habitat availability by increasing flows in-between the Lower Centerville diversion dam and the Centerville powerhouse during the spawning and egg incubation period (late-September to February), while balancing power production. PG&E also proposes the plan would consider modifications to facility operations and maintenance necessary to avoid, minimize, or improve project - related impacts to spring-run Chinook salmon.

PG&E's proposed long-term operations plan is consistent with Forest Service 4(e) condition 24, Forest Service 10(a) recommendation 15, Cal Fish & Game 10(j) recommendation 4, FWS 10(j) recommendation 13 and NMFS 10(j) recommendation 8. However, FWS, Cal Fish & Game, and NMFS further recommend that PG&E consult with the Water Board and the Commission and that this plan specify how other project facilities are to operate in both Butte Creek and the West Branch Feather River, how and when water is diverted, and likely times for maintenance activity of project facilities. These agencies further recommend the plan would be filed with the resource agencies. The Forest Service also requires in 4(e) condition 24 that when developing this plan, they also should be included in the consultation.

NMFS further recommends in its 10(j) recommendation 8 that this long-term operations plan would contain provisions for the installation of remote operating capability as well as addition real-time water temperature and reservoir elevation and flow gages in Round Valley and Philbrook reservoirs. NMFS recommends the location of these gages would be agreed upon by Cal Fish & Game and NMFS. Because this measure addressed reservoir and stream gages, it is discussed above under *Instream Flow and Reservoir Level Monitoring*.

NMFS further recommends in its 10(j) recommendation 8 that this plan contain: (1) modifications to project facilities and operations necessary to release project flows from various locations from Centerville canal into the diverted reach below Centerville diversion dam; (2) gravel enhancement and pool development to increase physical habitat; and (3) develop operational alternatives in the event that Centerville powerhouse is shut down during the spawning period.

Lastly, FWS in 10(j) recommendation 13 and NMFS in 10(j) recommendation 8 further recommend that the long-term operations plan contain a water temperature monitoring plan, as discussed and analyzed above in *Water Temperature Monitoring*.

Comprehensive Monitoring Report and Adaptive Management – Cal Fish & Game's 10(j) recommendation 5 provides that, during the sixth year of license issuance, PG&E would develop, in consultation with the agencies, and submit a comprehensive monitoring and adaptive management summary report. Cal Fish & Game states that PG&E shall implement any adaptive management measures specified in the report upon Commission approval.

*Our Analysis*

Conducting annual meetings to review the results of monitoring reports and to consider any need to modify project operation or environmental measures would help to ensure that National Forest System lands and other important environmental resources are protected. Opening the meeting to other resource agencies would assist with interpretation of monitoring results and ensure that the full range of effects of any proposed changes in operation or measures are fully considered.

Since 1999, PG&E has operated the project based upon an annual Project Operations and Maintenance Plan that is developed in consultation with Cal Fish & Game, NMFS, and FWS. This plan outlines the procedures and practices followed by PG&E in the operation and maintenance of the project facilities with the goal of protecting and enhancing habitat for spring-run Chinook salmon in lower Butte Creek. Under this annual plan, water is released from Round Valley reservoir, followed by the release of water from Philbrook reservoir as high temperatures occur during the summer. These releases, together with the diversion of natural flow from the West Branch Feather River, provide an additional source of cool water to lower Butte Creek for the benefit of Chinook salmon and steelhead.

PG&E's proposal to develop and implement a long-term operations plan, consistent with Forest Service 4(e) condition 24, Forest Service 10(a) recommendation 15, Cal Fish & Game 10(j) recommendation 4, FWS 10(j) recommendation 13 and NMFS 10(j) recommendation 8, is similar with the goals of the current annual Project Operations and Maintenance Plan. This long-term operation plan would utilize information from previous year's operating plans and results collected through recent

relicensing studies, and the results of future monitoring to define long-term procedures and practices in an attempt to provide habitat conditions that support healthy populations of spring-run Chinook salmon and steelhead in lower Butte Creek, and other aquatic species in all project-affected reaches of Butte Creek and the West Branch Feather River.

## 3.3.3 Terrestrial Resources

### 3.3.3.1 Affected Environment

#### Vegetation

The project area is predominantly forested. Douglas fir-ponderosa pine is the dominant vegetation type in the study area, encompassing about 40 percent of the study area (PG&E, 2007, section 6.5.2.2). At mid- to upper-elevations, black oak, sugar pine, and incense cedar are found. Tan oak is often present in the shrub and tree layers. Large amounts of canyon live oak (11.5 percent), white fir (10.1 percent), and ponderosa pine (9.8 percent) vegetation types are also found in the study area.

#### Wetlands/Riparian Vegetation

Montane riparian forest (white alder series) is found along the West Branch Feather River and upper Butte Creek, and their tributaries. The riparian corridor is typically narrow and discontinuous, due largely to gradient and bedrock constraints. Other characteristic species include: black cottonwood, arroyo willow, redtwig dogwood, California wild grape, thimbleberry, Bolander's sedge, hedgenettle, bracken fern, ciliate willow-herb, and American brooklime.

Riparian scrub is found along West Branch Feather River and Butte Creek, as well as various tributary streams, and may also be associated with project canals and reservoir shoreline (littoral) areas. The riparian corridor is vegetated primarily with winter-deciduous shrubs to small trees. Plant species characteristic of the region include shining willow, Lemmon's willow, sandbar willow, and arroyo willow.

Freshwater marshes may occur locally as a narrow fringe of emergent vegetation associated with the reservoir shorelines.

#### Noxious Weeds

PG&E and Sierra Pacific Industries (SPI) surveyed areas within about 200 feet of the project boundary, project-affected stream reaches, and project roads located within the project boundary between May and September 2006 (PG&E, 2007, section 6.5.2.3). The Willow Day Use Area and roads that provide direct access to Philbrook reservoir from the main county road were also surveyed. Nine target noxious weed species were found during the surveys: (1) black locust, (2) common fig, (3) English ivy, (4) French

broom, (5) Johnson grass, (6) periwinkle, (7) Spanish broom, (8) tocalote, and (9) tree-of-heaven. A total of 213 occurrences and about 72 acres were found in the surveyed area. None of these species have a California Department of Food and Agriculture pest rating of A or B (known economic importance). Weeds were prevalent at high traffic, disturbed, mid- and low-elevation areas, such as powerhouses and recreation sites. Large populations were also located on less-disturbed flume reaches along Butte Creek Canyon, and flume reaches that cross residential areas.

The most common weed species were Spanish and French broom, totaling about 68 percent of the weed occurrence and 95 percent of the acreage. These shrubs are abundant in Butte Creek Canyon along the flumes and creek. A substantial population of Spanish broom exists near the DeSabla powerhouse. Large occurrences of both species grow around the DeSabla forebay and associated flume trails and public access roads.

**Special-status Plant Species**

PG&E conducted rare plant surveys in July and August 2006 and April and May 2007 of areas within about 200 feet of the project boundary, project-affected stream reaches, and project roads located within the project boundary, excluding SPI lands (PG&E, 2007, section 6.5.2.1). The target sensitive species found in the in the study area are summarized in table 3-30.

Table 3-30. Target special-status plant species identified by PG&E during 2006 field surveys. (Source: PG&E, 2007, section 6.5.2.1)

| Species | Rating (Forest Service/CNPS)[a] | Number of Mapped Points | Number of Mapped Polygons | Acreage of Plants | Approximate Number of Total Plants |
|---|---|---|---|---|---|
| Ahart's sulfur-flower *(Eriogonum umbellatum* var. "*ahartii")* | sensitive/-- | 1 | 2 | 1.56 | 80 |
| Butte County calycadenia *(Calycadenia oppositifolia)* | sensitive/4.2 | 1 | -- | -- | 5 |

| Species | Rating (Forest Service/CNPS)[a] | Number of Mapped Points | Number of Mapped Polygons | Acreage of Plants | Approximate Number of Total Plants |
|---|---|---|---|---|---|
| Butte County morning glory *Calystegia atriplicifolia* ssp. *buttensis* | sensitive/1B.2 | 120 | 13 | 41.07 | 6,872 |
| Dissected-leaved toothwort *(Cardamine pachystigma* var. *dissectifolia)* | special interest/3 | 24 | -- | -- | 862 |
| Clarkia (past flowering, unidentifiable to species) | Unknown until identified | 12 | -- | -- | 150 |
| Cut-leaved ragwort *(Senecio [Packera] eurycephalus* var. *lewisrosei)* | special interest/1B.2 | 7 | -- | -- | 40 |
| Humboldt lily *(Lilium humboldtii* ssp. *Humboldtii)* | special interest/4.2 | 11 | -- | -- | 45 |
| Potential Humboldt lily (not flowering) | special interest/4.2 | 22 | -- | -- | 78 |
| Butte County missionbells *(Fritillaria eastwoodiae)* | sensitive/3.2 | 31 | 1 | 0.31 | 508 |
| Jepson's onion *(Allium jepsonii)* | sensitive/1B.2 | 6 | 3 | 1.35 | 200-250 |
| Sanborn's onion *(Allium sanbornii* var. *sanbornii)* | special interest/4.2 | 9 | 2 | 14.11 | 650-700 |

| Species | Rating (Forest Service/CNPS)[a] | Number of Mapped Points | Number of Mapped Polygons | Acreage of Plants | Approximate Number of Total Plants |
|---|---|---|---|---|---|
| shield-bracted monkeyflower *(Mimulus glaucescens)* | special interest/4.3 | 41 | 3 | 5.71 | 10,000-12,2000 |
| tall checkerbloom *(Sidalcea "gigantea")* | special interest/-- | 2 | -- | -- | 10-15 |
| white-stemmed clarkia *(Clarkia gracilis* ssp. *Albicaulis)* | sensitive/1B.2 | 6 | 2 | 0.55 | 1,000-1,100 |

[a] Status definitions:

California Native Plants Society (CNPS)

List 1B = Plants rare, threatened, or endangered in California and elsewhere

List 2 = Plants rare, threatened, or endangered in California, but more common elsewhere

List 3 = Plants about which more information is needed – a review list

List 4 = Plants of limited distribution – a watch list

Extension codes:

.3 = Not very endangered in California

.2 = Fairly endangered in California

.1 = Seriously endangered in California

Seven of the species (white-stemmed clarkia, Humboldt lily, Butte County calycadenia, shield-bracted monkeyflower, Butte County missionbells, dissected-leaved toothwort, and cut-leaved ragwort) may have been more widespread in the study areas, particularly in inaccessible serpentine areas.

Surveys also noted inaccessible or unsafe areas that contained serpentine habitat and/or provided potential habitat for lady's-slippers (11.27 acres), Cantelow's lewisia (68 acres), and the aquatic lichen Hydrotheria venosa.

Surveys conducted by SPI on its lands between May and September 2006 detected eight special-status species (PG&E, 2007, section 6.5.2.1) (table 3-31).

Table 3-31. Target special-status plant species identified by SPI during 2006 field surveys. (Source: PG&E, 2007, section 6.5.2.1)

| Species | Status[a] | No. locations | No. plants |
|---|---|---|---|
| Mildred's farewell-to-spring (*Clarkia mildrediae* ssp. *mildrediae*) | CNPS list 1B.2 | 2 | 1,000 |
| Butte County morning glory (*Calystegia atriplicifolia* var. *buttensis*), | CNPS list 1B.2 | 20 | 1,000 |
| moonwort (*Botrychium ascendens*) | CNPS List 2 | 4 | 50 |
| Gordon True's manzanita (*Arctostaphylos mewukka* ssp. *truei*) | CNPS List 4 | 13 | 275 |
| Marsh claytonia (*Claytonia palustris*) | CNPS List 4 | 17 | 3,000 |
| Clustered lady's slipper (*Cypripedium fasciculatum*) | CNPS List 4 | 1 | 3 |
| Shield-bract monkeyflower (*Mimulus glaucescens*) | CNPS List 4 | 11 | 450 |
| Obtuse starwort (*Stellaria obtuse*) | CNPS List 4 | 9 | 2,100 |

[a] See table 3-30 for status designations.

**Wildlife Resources**

The project area supports a diverse array of habitats and associated wildlife species. Black-tailed and California mule deer are the most common big game species in the project area. The deer are part of the East Tehama deer herd that inhabits portions of Tehama, Plumas, Lassen, Shasta, and Butte Counties. Migration routes to and from seasonal ranges are the longest in the state, a distance of 50 to 100 miles. Deer migrate from the high elevation forest in Lassen National Park to their winter habitat in eastern Tehama County.

Game bird species include California quail, mountain quail, blue grouse, mourning dove, ring-necked pheasant, and wild turkey. Canada geese nest at Round Valley reservoir.

Pacific tree frogs, long-toed salamanders, bullfrogs, various species of garter snake, California newts, rough-skinned newts, western toads, and rattlesnakes were observed in the project area (PG&E, 2008, section 6.3.2.1).

**Special-status Wildlife Species**

Surveys were conducted for the bald eagle, osprey, peregrine falcon, willow flycatcher, and special-status bat species (PG&E, 2007, section 6.4.2.1), as well as special-status amphibian and aquatic reptile species (PG&E, 2007, section 6.3.2.1); the results are discussed below. For other potential special-status wildlife species, PG&E used the California Wildlife Habitat Relationship System to predict their potential occurrence and distribution within the study area (PG&E, 2007, section 6.4.2.4).

Bald Eagles (federally delisted; California endangered) – Bald eagles are permanent residents and uncommon winter migrants throughout the state of California. They breed primarily in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties. Bald eagles forage near large aquatic ecosystems such as lakes, reservoirs, or free flowing rivers. Nesting usually occurs in large trees along shorelines in relatively remote areas. Breeding occurs in February through July, with the peak activity in March through June.

PG&E conducted bald eagle nesting surveys by helicopter in April, May, and June 2006. No bald eagles or bald eagle nests were found. Nesting habitat and prey base in lower Butte Creek appear adequate to support breeding bald eagles. The bald eagle population is expanding in California, and their colonization of new breeding locations adds to the state breeding population every year.

PG&E conducted bald eagle wintering surveys from November 2006 to February 2007. One adult bald eagle was observed perched along Butte Creek upstream of Centerville powerhouse. Single observations of bald eagles during December and January surveys indicated that the project area supports only low numbers of wintering bald eagles.

Osprey (Forest Service management indicator species) – Osprey nest close to large lakes and rivers and feed almost exclusively live fish. PG&E conducted osprey nesting surveys in conjunction with bald eagle helicopter surveys in April, May, and June 2006. Two active osprey nests were located: one along Butte Creek near the Butte siphon and one along the north shore of Philbrook reservoir. Two additional nests were found along the shoreline of Paradise Lake, a non-project reservoir east of DeSabla forebay, during bald eagle wintering surveys.

Peregrine Falcon (federally delisted; California endangered) – Peregrine falcons frequent bodies of water in open areas with cliffs and canyons nearby for cover and nesting. PG&E identified five areas along lower Butte Creek as potential peregrine falcon nesting cliffs during habitat assessments conducted by helicopter concurrent with nesting bald eagle and osprey surveys and wintering bald eagle surveys. Ground searches were conducted for nesting peregrine falcons at survey locations during March and May 2007. Two previously unknown peregrine falcon territories were discovered during ground surveys (March 2007); falcons successfully nested at one territory and occupied but did not nest at the other territory.

Willow Flycatcher (California endangered; Forest Service species of concern) – Willow flycatcher habitat typically consists of riparian habitat, often dominated by willows and alders. PG&E identified suitable, but marginal, habitat on the eastern side of Philbrook reservoir at the inlet of Philbrook Creek and at the northeastern end of Round Valley reservoir; no flycatchers were detected during the surveys (PG&E, 2007, section 6.4.2.2).

Bat Species – Man-made structures provides important roosting habitat for many bat species. Surveys conducted by PG&E identified the following bat species in the project area: Yuma myotis, western red bat, big brown bat, little brown bat, and California myotis (PG&E, 2007, section 6.4.2.3). In addition, one bat roost was identified at the Centerville powerhouse used by the Yuma myotis. The only special-status bat species identified was the western red bat (Forest Service sensitive); this species, located at the Hendrix diversion dam, was likely using that area for foraging.

Foothill Yellow-legged Frog (California species of special concern) – The foothill yellow-legged frog occurs in the coast ranges from the Oregon border south to the Transverse Mountains in Los Angeles County; in most of northern California west of the Sierra Cascade crest; and along the coast ranges north of Monterey from sea level to 6,000 feet in the Sierra Nevada mountains.

The foothill yellow-legged frog is typically found in small, low gradient, rocky streams with exposed boulders that provide sunning spots for adults. During the non-breeding season, frogs are resident in tributary streams. Breeding frogs use wide, shallow reaches near the mouths of tributaries. The females attach egg masses to cobbles and boulders in shallow, slow-moving backwaters and in depositional areas such as point bars and cobble/boulder bars at pool outlets.

Newly emerged tadpoles remain around the egg masses for several days before dispersing into the gravel or moving downstream to areas of moderate flow. Breeding sites are often separated by large distances of hundreds or thousands of meters. After breeding, adults disperse to deep pools. By fall and winter adult males and females are found primarily near pools, while juveniles are found at riffles on mainstem rivers.

Tributaries are used by both juveniles and adults as refuges from summer heat and high water flows in winter and spring.

After evaluating potential sites using video, aerial photographs, and ground reconnaissance, PG&E conducted full-reach surveys at nine sites on Butte Creek (6.8 river miles surveyed) and seven sites on the West Branch Feather River (2.1 river miles) (PG&E, 2008, section 6.3.2.1). PG&E observed foothill yellow-legged frog in various life stages, and were well distributed at the visual encounter survey sites throughout the study area (table 3-32). Evidence of foothill yellow-legged frog breeding (presence of egg masses or tadpoles) was observed in 7 of the 11 visual encounter survey sites on Butte Creek, and in four of the seven sites on the West Branch Feather River. Foothill yellow-legged frog egg masses were slightly more abundant in Butte Creek than they were in the West Branch Feather River. Evidence of foothill yellow-legged frog breeding was observed as far downstream as RM 49 on Butte Creek and RM 15 on the West Branch Feather River. Post-metamorphic foothill yellow-legged frogs were observed as far downstream as the Parrott-Phelan diversion dam (RM 46.2) on Butte Creek. Foothill yellow-legged frog post-metamorphic frogs and evidence of breeding were observed as far upstream as RM 66.1 on Butte Creek, and RM 22 on the West Branch Feather River.

Mountain Yellow-legged Frog (federal candidate species and California species of special concern) and Cascade Frog (California species of special concern) – No suitable habitat areas for the Cascade frog or mountain yellow-legged frog (MYLF) or individuals were identified during stream surveys for the foothill yellow-legged frog. Although there are incidental reports of MYLF using riverine habitat as low as 4,500 feet elevation in the South Fork Feather River watershed, all the sites surveyed in Butte Creek were well below the elevational range for MYLF (all sites surveyed were below 3,000 feet elevation). Cascade frogs have similar elevational restrictions as MYLF, and no lentic habitat was identified for this species in either Butte Creek or in the West Branch Feather River.

Northwestern Pond Turtle (California species of special concern) – The southwestern pond turtle occurs throughout the Sierra Nevada, typically below 4,500 feet (Lovich, 1995). This species occurs in rivers, streams, lakes, ponds, and seasonal wetlands where still or slow-moving water is present. In streams, pools are the preferred habitat (Bury, 1972). Although pond turtles spend much of their lives in water, they require terrestrial habitats for nesting. Females excavate nests up to 0.25 mile from water, usually on south to southwest-facing slopes. They also often overwinter on land, disperse via overland routes, and may spend part of the warmest months in estivation on land. Pond turtles are generally wary, but they may be seen basking on emergent or floating vegetation, logs, rocks, and occasionally mud or sand banks.

Table 3-32. Summary of foothill yellow-legged frog observations, 2006. (Source: PG&E, 2008, section 6.3.2.1)

| | | Lifestage Observation Point Characteristics | | | | | | Site Characteristics | |
|---|---|---|---|---|---|---|---|---|---|
| **FYLF Lifestage** | **Observation of Lifestage** | **Water Temperature (degrees C)[a]** | **Max Depth (cm)** | **Water Velocity (cm/sec)** | **Canopy/Shade Cover (%)** | **Algal Cover (%)** | **Detritus Cover (%)** | **Non-Native Predator Presence?** | **Native Predator Presence?** |
| **Butte Creek between Butte Creek Diversion Dam and Lower Centerville Diversion Dam (includes sites BC-6, -7, -8, -9, and -12)** | | | | | | | | | |
| Egg Masses | Y | 16 (14-24) [2.4] | 24 (0-64) [21] | 0.7 (0-4) [1.3] | | | | None | Observed at all sites in reach. Species included trout, aquatic garter snakes, terrestrial garter snakes, and California newts. |
| Tadpoles | Y | 19 (9-27) [3.3] | 27 (2-250) [33] | 2 (0-21) [4.4] | | 53 (0-100) [33] | 28 (0-100) [32] | | |
| Young-of-Year | Y | Edge: 16 (11-20) [2.3] Mainstem: 16 (14-19) [1.7] | | | 24 (0-100) [35] | | | | |
| Juveniles | Y | | | | 30 (0-100) [34] | | | | |
| Adults | Y | | | | 38 (0-100) [32] | | | | |
| **Butte Creek between Centerville Powerhouse and Parrot-Phelan Diversion Dam, a Non-Project Structure (includes sites BC-1, -2, -3, and -4)** | | | | | | | | | |
| Egg Masses | N | | | | | | | American bullfrogs observed at sites BC-1, BC-2, and BC-3 | Observed at all sites in reach. Species included trout, aquatic garter |
| Tadpoles | Y | 18 (15-22) [1.5] | 14 (0.5-45) [10] | 2.6 (0-23) [5.5] | | 69 (25-100) [26] | 5.8 (0-25) [6.4] | | |
| Young-of-Year | Y | Edge: 18 (15-22) [2.2] Mainstem: 17 | | | 14 (0-100) [29] | | | | |
| Juveniles | Y | | | | 12 (0-100) [28] | | | | |

| | | Lifestage Observation Point Characteristics | | | | | | Site Characteristics | |
|---|---|---|---|---|---|---|---|---|---|
| **FYLF Lifestage** | **Observation of Lifestage** | **Water Temperature (degrees C)[a]** | **Max Depth (cm)** | **Water Velocity (cm/sec)** | **Canopy/Shade Cover (%)** | **Algal Cover (%)** | **Detritus Cover (%)** | **Non-Native Predator Presence?** | **Native Predator Presence?** |
| Adults | Y | (15-20) [2.3] | | | 0 | | | | snakes, terrestrial garter snakes, and California newts. |
| **WBFR between Round Valley Reservoir and Hendrick s Diversion Dam (includes sites WBFR-7, -8, and -9)** | | | | | | | | | |
| Egg Masses | N | | | | | | | None | Trout and aquatic garter snakes observed at sited WBFR-7 and WBFR-8 |
| Tadpoles | N | | | | | | | | |
| Young-of-Year | N | Edge: 12 (8-15) [2.3] | | | | | | | |
| Juveniles | N | Mainstem: 10 (8-12) [1.8] | | | | | | | |
| Adults | N | | | | | | | | |
| **WBFR between Hendrick s Diversion Dam and the Miocene Diversion, a Non-project Structure (includes sites WBFR-1, -2, -5, and -6)** | | | | | | | | | |
| Egg Masses | Y | 17 (15-20) [1.4] | 32 (8.5-90) [20] | 2.9 (0-10) [4] | | | | None | Observed at all sites in reach. Species observed included California newts, |
| Tadpoles | Y | 19 (15-26) [2.5] | 20 (5-100) [17] | 0.7(0-6) [1.1] | | 23 (0-95) [26] | 16 (0-70) [19] | | |
| Young-of-Year | Y | Edge: 19 (13-26) [4] | | | 23 (0-100) [34] | | | | |

| | | Lifestage Observation Point Characteristics | | | | | | Site Characteristics | |
|---|---|---|---|---|---|---|---|---|---|
| **FYLF Lifestage** | **Observation of Lifestage** | **Water Temperature (degrees C)[a]** | **Max Depth (cm)** | **Water Velocity (cm/sec)** | **Canopy/Shade Cover (%)** | **Algal Cover (%)** | **Detritus Cover (%)** | **Non-Native Predator Presence?** | **Native Predator Presence?** |
| Juveniles | Y | Mainstem: 19 (13-26) [4.9] | | | 30 (0-100) [31] | | | | rough-skinned newts, and aquatic garter snakes. |
| Adults | Y | | | | 32 (0-100) [29] | | | | |

[a] Edge and mainstem water temperatures listed for post-metamorphic lifestages were averaged from the general site data and are not averages of specific point observations, as most individuals were not observed in the water.

WBFR = West Branch Feather River

BC = Butte Creek

One northwestern pond turtle yearling was observed in Butte Creek at site BC-2 and two adult northwestern pond turtles were observed basking on logs on the right bank of site BC-2 in a backwater area (PG&E, 2007, section 6.3.2.1). No other western pond turtles were observed in the study area.

Other Species – The California Wildlife Habitat Relationship System predicted the presence of suitable habitat for 57 special-status wildlife species within the study area. The species list was comprised of 2 reptiles, 45 birds, and 10 mammals (PG&E, 2007, section 6.4.2.4, table E6.4.2.4.4-1). The California spotted owl has been recorded in the project area near Philbrook and Round Valley reservoirs and near the headwaters of Clear Creek. American martens have been recorded in the vicinity of Philbrook reservoir. More information on the habitat requirements of these is found in the license application (PG&E, 2007, appendix E6.4.2.4-A).

#### 3.3.3.2 Environmental Effects

**Vegetation and Invasive Species Management**

The presence of noxious weed species near project facilities has the potential to alter natural plant communities. Vegetation management at project facilities could adversely affect native plant communities, rare plants, and wildlife habitat.

PG&E proposes to prepare an invasive weed management plan that addresses aquatic and terrestrial invasive weeds within the project boundary and adjacent to project features directly affecting Forest Service lands, including roads and distribution and transmission lines.

The invasive weed management plan would address the following elements:

- Inventory and mapping of new populations of invasive weeds;
- Action and/or strategies to prevent and control spread of known populations or introductions of new populations, such as vehicle/equipment wash stations;
- Development of a schedule for control of all known A, B, Q and selected other rated invasive weed species, designated by resource agencies;
- On-going annual monitoring of known populations of invasive weeds for the life of the license in locations tied to project actions or effects, such as road maintenance, at project facilities, O&M activities, new construction sites, etc., to evaluate the effectiveness of revegetation and invasive weed control measures; and

- An adaptive management element to implement methods for prevention of aquatic invasive weeds, as necessary, such as: public education and signing of public boat access, preparation of an aquatic plant management plan, and boat cleaning stations at boat ramps for the removal of aquatic invasive weeds.

PG&E proposes to control new infestations of A and B rated weeds shall within 12 months of detection or as soon as is practical and feasible. Monitoring would be done in conjunction with other project maintenance and resource surveys, so as not to require separate travel and personnel. To assist with this monitoring requirement, training in invasive plant identification would be provided to project employees and contractors by the Forest Service.

PG&E would restore/revegetate areas where treatment has eliminated invasive weeds in an effort to eliminate the reintroduction of invasive weed species. Project-induced ground disturbing activities would be monitored annually for the first 3 years after disturbance to detect and map new populations of invasive weeds. PG&E would revegetate disturbed areas utilizing only native plant material, guaranteed weedfree. Seed shall come from local collection sites, whenever possible, to protect the local plant genotypes.

PG&E proposes to develop a vegetation management plan for Forest Service lands within the project boundary. The plan would include and/or address the following elements:

- Hazard tree removal and trimming;
- Powerline/transmission line clearing;
- Vegetation management for habitat improvement, including for visual screening;
- Revegetation of disturbed sites;
- Soil protection and erosion control, including use of certified weed free straw;
- Establishment of and/or revegetation with culturally important plant populations; and
- Use of clean, weed free seed with a preference for locally collected seed.

These measures are consistent with Forest Service 4(e) condition 31 and FWS 10(j) condition 12, except as noted below.

PG&E also proposes to clear vegetation necessary to reduce fire hazards as part of its proposed fire prevention, response, and investigation plan.

In addition to PG&E's adaptive management measures to prevent the spread of aquatic weeds, the Forest Service specifies and FWS recommends that PG&E prepare an aquatic invasive/noxious plant management plan that outlines best management practices for the prevention of invasive aquatic species.

The Forest Service also specifies that PG&E develop a source of local native plant materials for revegetation projects so that a sufficient source would be available throughout the life of the project. The Forest Service also specifies that use of persistent non-native, non-invasive plant material would only be allowed when timely reestablishment of a native plant community, either through natural regeneration or with use of native plant materials, is not likely to occur. In those cases, cereal barely or wheat could be used.

*Our Analysis*

Noxious weeds can displace native plants, reduce biodiversity, affect threatened and endangered species, alter normal ecological processes (e.g., nutrient cycling, water cycling), decrease wildlife habitat, reduce recreational value, and increase soil erosion and stream sedimentation. PG&E has identified nine target noxious weed species in the project area.

Development of an invasive/noxious species management plan covering both terrestrial and aquatic species would ensure that these species are controlled throughout the term of the license and would help maintain native plant diversity and habitat quality. Expanding these measures to all project lands and not just Forest Service lands would ensure more complete control of these species.

Vegetation management such as roadside mowing, weed control, and revegetation could have both positive and negative effects on project-area natural resources, cultural values, and aesthetics.

Development of a vegetation management plan would ensure that these activities are conducted in a manner that minimize disturbance to vegetation and provides for the revegetation of disturbed areas. Many of these activities would occur on lands outside the National Forest. Expanding PG&E's management plan to all accessible project lands would provide additional resource protection.

Vegetation management could also be important in fuels reduction and fire prevention. Inclusion of such measures as part of the proposed fire prevention, response, and investigation plan would protect project resources from fire hazards.

**Special-status Species**

Recreational activities have the potential to affect special-status plant species. Further, the project could potentially affect special status species in the future as a result of new construction activities or existence of newly listed species. The foothill yellow-legged frog and bald eagle is discussed in separate sections below.

PG&E proposes to conduct an annual review of the current list of special status species (federal endangered and threatened, Forest Service sensitive, or Lassen and Plumas National Forest Watch List) to determine if any new species have been added to the lists. In the event that a species is likely to occur on Forest Service lands in the project area and would be directly affected by the project, PG&E would assess the effects, develop necessary information, and recommend resource measures. This proposal is consistent with Forest Service 4(e) condition 26, except the Forest Service condition does not apply to federally listed species. FWS [10(j) condition 9B] would expand the measure to include BLM sensitive/watch list species and federal and state rare, threatened, or endangered species and would apply to all project lands.

PG&E also proposes to provide training to operations and maintenance staff on the identification of special-status species, methods to avoid sensitive areas and minimize disturbance during critical life-stages, and consultation.

In addition, Forest Service [4(e) condition 27] specifies that before construction of any new project features on Forest Service lands that may affect special status species (Forest Service sensitive and/or management indicator species) or their critical habitats, PG&E prepare a biological evaluation of the potential effects of the action on the species or its habitat. Based on the evaluation, the Forest Service may specify mitigation measures for the protection of the affected species. FWS [10(j) condition 9A] would expand the condition to include federally listed and candidate species and their habitats and would apply to all project lands.

*Our Analysis*

Numerous special-status plant species are found in the project area; however, the only identified project-related effects are associated with informal recreation at low elevation reservoirs and stream reaches (PG&E 2007a, section 7.5.4).

The DeSabla forebay and associated flume areas are easily accessible and well-traveled. Large occurrences of Butte County morning glory are present; Humboldt lily was also noted at this location. The eastern side of the reservoir and trails to the north experience a great deal of human disturbance, most notably littering, foot traffic, and informal parking on road shoulders and reservoir banks. A formal camp and cabins on the west side of the reservoir may also contribute to disturbance, but effects on the west side of the reservoir appear to be less intense. French broom, a noxious weed species, is

also becoming well-established at the DeSabla forebay and along trails to the north, potentially affecting habitat suitability of rare plants.

Informal recreation occurs around the access area at the Miocene dam at the base of the "Magalia Serpentine." Several special status plants (Ahart's sulfur flower, Jepson's Onion, cut-leaved ragwort, Butte County calycadenia, and shield-bracted monkeyflower) are located in proximity to this dam. The majority of the recreational activity appears to be focused on the river access and little disturbance was noted in rocky upland areas where special status plants were typically observed. An informal camp was noted in proximity to individuals of Jepson's onion, and may be impacting individuals of this species found near the West Branch Feather River. Noxious weeds, notably Spanish broom, were also mapped at this access point.

At other project-affected stream reaches at mid- to low-level elevations, informal recreation does not appear to be affecting special status plants because most potentially occurring species are not found in conjunction with water access. Shield-bracted monkeyflower is an exception, occurring commonly in rocky, wet drainages throughout the project area. However, informal recreation does not appear to be limiting the distribution or persistence of this species.

PG&E did not document any special-status plants near the project's high elevation reservoirs (areas in the vicinity of Philbrook reservoir and Snag Lake), whether in undisturbed or highly-used areas. As a result, the potential for effects of informal recreation on special status plant species in these areas appears low.

The annual review of the current list of federally listed species and Forest Service Sensitive or Lassen and Plumas National Forest Watch List and development of protective measures, as needed, proposed by PG&E, would provide a mechanism for the evaluation of effects of project operation and maintenance on newly listed species and development of appropriate protective measures. Expanding the review beyond the scope of the proposed measure to include BLM sensitive/watch list species and federal and state rare, threatened, or endangered species and all project lands, as recommended by FWS, would provide additional protection to special status species.

The biological evaluation of the potential effects of future actions on Forest Service sensitive and/or management indicator species or their critical habitats specified in Forest Service 4(e) condition 27 would ensure that special status species would not be adversely affected by new project-related construction. Expanding the evaluation beyond the scope of the 4(e) condition to include federally listed and candidate species and their habitats and all accessible project lands, as recommended by FWS, would provide additional protection to special-status species.

**Effects of Minimum Flows on Foothill Yellow-legged Frogs**

Changes in flow releases can affect habitat suitability, water temperature, riparian vegetation, and river geomorphology, with resultant effects on foothill yellow-legged frog populations. Effects of flow fluctuation are discussed above in section 3.3.2, *Aquatic Resources*.

PG&E proposes, Forest Service prescribes, and FWS, Cal Fish & Game, and Conservation Groups recommend minimum flow releases to improve fish habitat, as discussed in section 3.3.2, *Aquatic Resources*. In addition, the Conservation Groups recommend that if the Centerville development is not removed as they recommend, PG&E should provide a minimum bypass flow of 1 cfs in Helltown Ravine below Lower Centerville canal to benefit a known population of foothill yellow-legged frog.

*Our Analysis*

Habitat Availability – Change in flow can affect suitability of foothill yellow-legged frog habitat. Eggs and tadpoles are particularly vulnerable to changes in flows because these life stages are confined entirely to the aquatic environment (Kupferberg et al., 2007). PG&E modeled foothill yellow-legged frog egg masses and tadpole life stages (PG&E, 2008) at one location (Whiskey Flat study site on the West Branch Feather River) using habitat criteria developed by the FSC (Lind and Yarnell, 2008) (figure 3-47). According to the model, habitat (WUA) for egg masses and tadpoles decreases most as flow increases from 10 cfs to about 50 cfs and continues to decline through the range of modeled flows (300 cfs). As flows increase, the availability of shallow, slow-moving areas of the West Branch Feather River are less available.

The current year-round normal water-year minimum flow of 15 cfs for the West Branch Feather River below Hendricks diversion dam would be raised to 30 cfs during the early part of the breeding season (March through May) under all flow proposals and recommendations. Habitat for FLYF egg masses would decrease by about 15 percent. From June through October, minimum flows proposed by PG&E and recommended by the Conservation Groups would decrease to 20 cfs, increasing habitat for tadpoles by about 10 percent.

PG&E proposes and the resource agencies recommend normal water-year minimum flow increases from 16 cfs to 30 cfs during March through May downstream of Butte Creek dam and no changes to current flows from June through September; and 40 to 80 from March 16 through end of October downstream of Lower Centerville diversion dam. PG&E proposes to increase flows to 75 cfs from September 15 through the end of October while the agencies recommend increasing flows to 100 cfs from September through October.

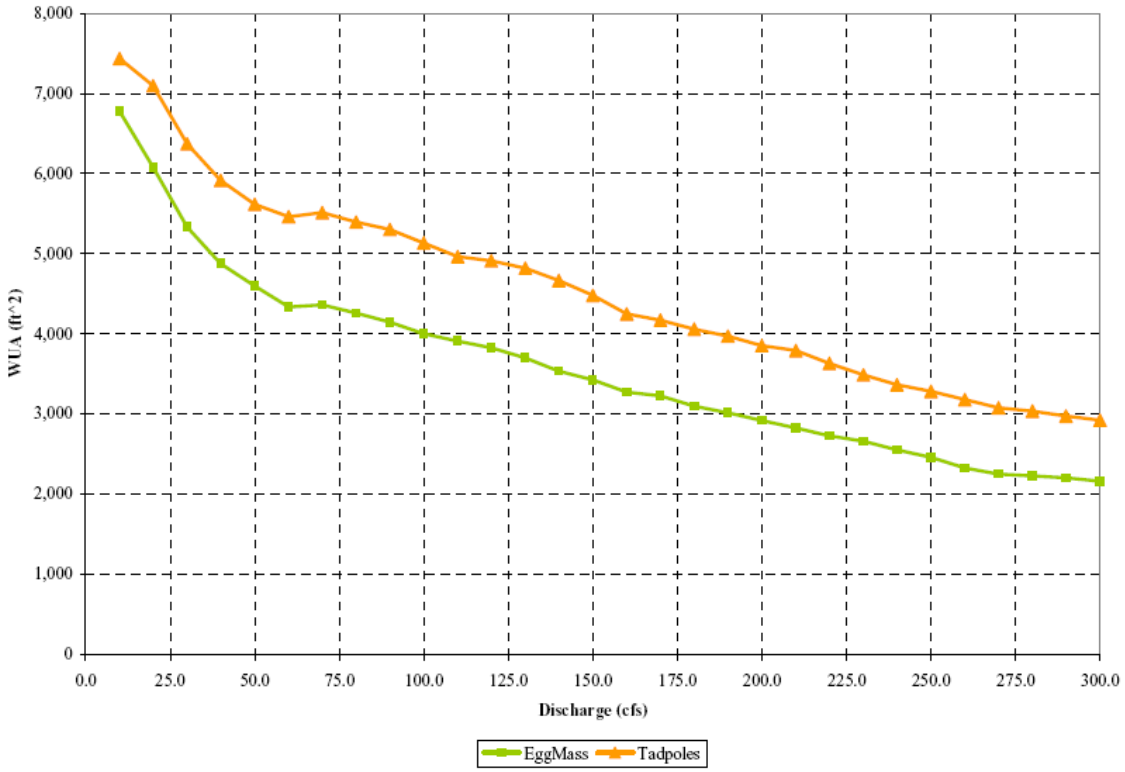


Figure 3-47. Weighted usable area (WUA) for foothill yellow-legged frog egg mass (lower curve) and tadpole (upper curve) life stages for the Whiskey Flat study site. (Source: PG&E, 2008)

Although habitat availability data is not available for Butte Creek, it is likely that habitat would decrease at the higher flows.

The relationship between suitable habitat and population size has not yet been tested, as populations may be limited by other factors such as temperature, competition and predation, and barriers to dispersal and re-colonization (Kupferberg et al., 2007). As with many rare species, populations at depressed levels may not be limited by available habitat.

Water Temperature – Increased minimum flows to provide fish habitat and cooler water to benefit coldwater fish populations could have indirect effects on foothill yellow-legged frog breeding. Water temperatures are important to foothill yellow-legged frog for two main reasons: temperatures must be high enough to initiate egg laying; and water must be warm for a sufficient period to allow for complete larval development. Delaying the initiation of breeding may result in insufficient time to complete development. Cooler water temperatures during the spring and summer months could potentially slow down foothill yellow-legged frog egg and tadpole development because it is outside the range of natural conditions for the foothill yellow-legged frog. Breeding is initiated between March and June and tadpoles take 3 to 4 months to complete metamorphosis.

Riparian Vegetation and Channel Morphology – Increased minimum flows during the growing season could alter the aquatic and riparian communities in the West Branch Feather River and Butte Creek. For some reaches, minimum flows would be increased 2- to 3-fold. Some vegetation would be seasonally inundated and lost while some upland and unvegetated areas would be converted to riparian vegetation from inundation and a rise in the water table. Changes in vegetation as a result of increased flows could affect habitat suitability for the FLYF through shading of breeding areas. Further, changes in flows could influence sediment deposition and channel shape and structure, affecting foothill yellow-legged frog habitat. The extent of these changes cannot be predicted with any certainty. Monitoring would detect any changes in breeding habitat.

**Foothill Yellow-legged Frog Monitoring**

FWS recommends in alternative 10(j) recommendation 7 and the Forest Service recommends in final 4(e) condition 20.2, that PG&E develop and implement a long-term foothill yellow-legged frog monitoring plan to monitor populations of foothill yellow-legged frog found during relicensing studies. The FWS recommendation would apply to the project-affected reaches of Butte Creek and West Branch Feather River where all life stages were found during relicensing studies while the Forest Service condition would only apply to Forest Service lands in the West Branch Feather River.

The recommended monitoring plan by FWS and Forest Service would include the following component:

- Populations monitoring: monitor the numbers of foothill yellow-legged frog egg masses, tadpoles and adults; develop a population model linking various life stage data; relate egg mass counts quantitatively to adult population size or overall population growth rate; and conduct a population viability analysis

FWS recommends and the Forest Service specifies 15 surveys during the license term. The monitoring frequency recommended by FWS would be annually for the first 4 years and last 4 years of the license and seven additional surveys evenly spaced out during the remainder of the license term. Egg masses, tadpoles, and adults would be monitored. Forest Service specifies annual surveys for the first 5 years and 4 years before relicensing studies commence as well as six additional surveys interspersed between the two monitoring periods. Egg masses, tadpoles, and adults would be surveyed for the first 4 years and only egg masses thereafter.

FWS also includes the following components:

- Temperature Monitoring: monitor water temperatures in the river to assess water temperature effects on eggs and tadpoles; and determine the species-specific effects of temperature (warmth, cooling, and stability) on development

rates of embryos (eggs) and larvae (tadpoles), growth rates of tadpoles, and size at metamorphosis

- Geomorphology and Riparian Encroachment Monitoring: monitor the geomorphologic and riparian vegetation response to the new flow regime in foothill yellow-legged frog habitats through the course of the license; and reassess stream flow prescriptions if substantial changes in bar geomorphology and/or riparian vegetation encroachment

- Habitat Monitoring: develop an experimental methodology to empirically determine the relationship between discharge and velocity, and discharge and stage at egg mass and tadpole sites; and monitor overall availability of suitable breeding/rearing habitats for the foothill yellow-legged frog in relation to both short and long-term changes

The Forest Service also specifies water temperature monitoring, especially in the margins where eggs and tadpoles occur, to assess the effects of water temperature on these life stages.

PG&E did not propose any foothill yellow-legged frog monitoring. PG&E comments that the agency plan is a series of costly research projects beyond the needs of the project. PG&E filed an alternative condition, proposing to survey of all reasonably accessible foothill yellow-legged frog habitats (i.e., full-reach visual encounter survey) for 3 consecutive years after the issuance of the license, then every 5 years thereafter. Monitoring would be conducted at the four lower West Branch Feather River sites on Forest Service lands that were surveyed during the relicensing studies. If monitoring documents adverse effects, PG&E would conduct focused studies and/or implement protective measures.

*Our Analysis*

As discussed above, the proposed and recommended changes in ramping rates and minimum flows and associated changes in water temperature can potentially affect the various life history stages of the foothill yellow-legged frog. Monitoring all life stages of foothill yellow-legged frog over time would allow an evaluation of potential effects of operational changes, along with the need for protective measures or additional studies. Early detection of potential effects would provide more time for the development and implement of any appropriate measures.

The agencies' plan would allow for the detection in changes in numbers of foothill yellow-legged frog life stages during the term of the license that would be useful in determining effects of changes in project operation on the frog. Many of the components of the monitoring plan, however, involve basic research efforts (e.g., development of a

population model, population viability analysis, and study of effects of water temperature on frog growth).

PG&E's monitoring proposal would also allow the detection of changes in numbers of foothill yellow-legged frog in the West Branch Feather River over time. The monitoring would not include the Butte Creek populations, outside the National Forest.

It is difficult to predict how higher minimum flows and lower water temperatures would influence the rate of tadpole development (Kupferberg, 2006). Although cool temperatures are required for foothill yellow-legged frog breeding (river water temperatures must meet a strict temperature threshold before foothill yellow-legged frogs initiate breeding), foothill yellow-legged frogs evolved in relatively low elevation systems with warm summer temperatures that facilitate the rapid maturation of young of the year. Cooler temperatures during the foothill yellow-legged frog rearing period may slow development of foothill yellow-legged frog eggs, tadpoles, and metamorphs to some unknown degree. Possible effects include increased risk of predation or displacement due to longer periods of immobility or low mobility. Water temperature monitoring of foothill yellow-legged frog breeding areas would be important to determine the initiation of breeding and whether temperatures are suitable for growth.

The proposed and recommended population monitoring would provide an index of long-term changes in amphibian populations, following sufficient response time to stream flow modifications and other potential impacts. Water temperature monitoring data and the visual survey data could be used to determine how the proposed minimum flows would affect other foothill yellow-legged frog life stages. If the foothill yellow-legged frog populations are negatively affected by changes in flows and ramping rates specified in a new license and subsequent water temperature changes, then monitoring could identify these factors and could provide a means to develop protective measures.

Increases in flows could also alter existing riparian plant communities and channel morphology as discussed above. Monitoring these effects could detect changes in habitat conditions that could potentially affect foothill yellow-legged frog breeding sites.

Further study of this species beyond population monitoring, as recommended by FWS and as specified by the Forest Service, is unlikely to provide significant additional information that would be useful in assessing the effects of changes in project operation on this species. Monitoring could be used to determine the need for additional focused studies to better understand any identified adverse effects.

**Bald Eagle Management**

As discussed above, the project receives limited use by bald eagles. Bald eagles, however, may be subject to potential adverse effects if eagles inhabit the project area in

the future. FWS [10(j) condition 10] and Forest Service [10(a) condition 10] recommend that PG&E develop and implement a bald eagle monitoring plan.

In response to the agency recommendations, PG&E suggests one breeding and one wintering survey of project waters every 3 years. If a new nesting territory is established, PG&E would develop specific recommendations for the protection, conservations, and management of the nesting territory.

In comments on the draft EA, FWS and the Forest Service agree with a monitoring frequency of at least every 3 years.

*Our Analysis*

Bald eagles do not currently breed in the project area even though suitable habitat is present. Populations of eagles, however, are expanding in California.

Bald eagles have experienced a comeback as a result of the implementation of protective measures since the 1970s, including the banning of the pesticide DDT, protection of nest sites, and protection from shooting. Nesting has become common in the Feather River Basin. For example, 14 eagle nests are found in the vicinity of the North Fork Feather River Project No. 2105 (FWS, 2005), 4 nests in the vicinity of the Oroville Project No. 2100 (FWS, 2007), and 1 nest in the vicinity of the Poe Project No. 2107 (FERC, 2007).

Given the limited use of the project area, continued project operation would not adversely affect bald eagles. In the event that eagles nest in the project area or use the project area in greater numbers, they could be subject to project-related affects (e.g., disturbance from recreational use and maintenance activities). Monitoring would be useful in detecting changes in use and determining the need for future protective measures. Monitoring would be increasingly important as bald eagle populations in California continue to grow and expand their range.

**Deer Protection**

The Butte, Lower Centerville, Hendricks, and Toadtown canals, totaling about 30 miles, have the potential to entrap deer and other animals, limit animal movements, and fragment habitats and populations.

PG&E proposes to assess existing wildlife bridge crossings and escape structures annually to ensure they are functional and in proper working order. Inspections would occur during the same time other types of maintenance activities or canal assessments are being conducted. PG&E also proposes to record animal losses in all project canals. Further, prior to replacing or retrofitting existing wildlife bridge crossings or deer escape

facilities along project canals, PG&E proposes to consult with Cal Fish & Game regarding specifications and design.

The Forest Service conditions (conditions 28 and 29) and Cal Fish & Game's [10(j) recommendation 6] and FWS' [10(j) conditions 4B and 4C] recommendations are generally consistent with PG&E's proposal. The agencies, however, specifies that PG&E implement additional measures be implemented if an increasing trend in animal mortalities is noted (Forest Service condition 29). Cal Fish & Game also recommends that PG&E prepare a summary mortality report be prepared every 5 years.

*Our Analysis*

Between 1965 and 2006, a total of 520 deer have been killed by project canals. To correct this problem, PG&E installed deer protection facilities starting in 1978; these measures contributed to a significant decline in deer mortality in 1979 (figure 3-48). Additional deer protection facilities were constructed and modifications were made to some existing facilities in 1983, 1992-1993, and 2005. The types of deer protection devices installed included fencing, wooden bridge crossings, and flasher sets with either escape ramps or cyclone fencing (traction surface) bolted to the canal wall. As a result, average deer losses dropped from 31.4 deer per year (1965-1978) to an average 2.86 deer losses/year (1979-2006) (PG&E 2006).

Deer mortality is at relatively low levels and has little effort on the health of the East Tehama deer herd, which totals at least 15,000 individuals. Inspecting deer protection devices annually to ensure that they are functional, complying with current specifications when existing facilities are replaced or retrofitted, monitoring wildlife losses in the canals, and taking corrective actions in the event that mortalities increase would ensure that impacts to wildlife populations are kept to minimal levels.

### 3.3.4 Threatened and Endangered Species

#### 3.3.4.1 Affected Environment

**Valley Elderberry Longhorn Beetle**

The valley elderberry longhorn beetle (VELB), a federally listed threatened species, is found in the riparian areas of streams and rivers in the lower Sacramento and upper San Joaquin Valleys, where elderberry grows. The range of the VELB extends throughout California's Central Valley and associated foothills from about the 3,000-foot elevation on the east to the watershed boundary of the Central Valley on the west. The VELB is completely dependent on its host plant, elderberry (*Sambucus* spp.), which is a common component of the VELB.

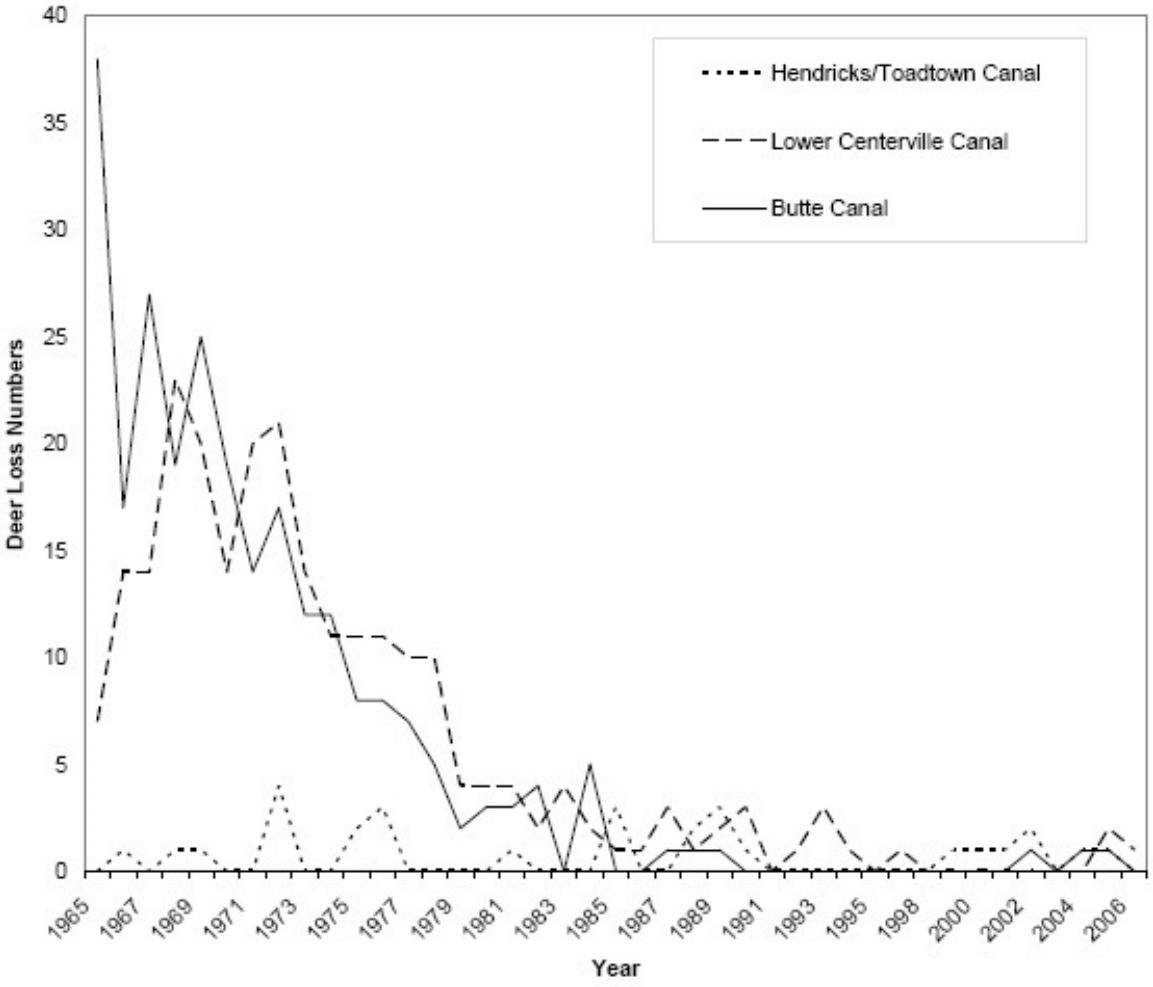


Figure 3-48. Deer losses at the DeSabla-Centerville Hydroelectric Project from 1965 through 2006. (Source: PG&E, 2006)

PG&E performed field surveys in June, July, and August 2006 and found a total of 14 blue elderberry shrubs (*Sambucus mexicana*) at nine different sites (occurrences) (PG&E, 2007, section 6.7.2.2). Nine of these elderberry shrubs (occurrences #1 and #6–8) are considered suitable VELB habitat, as they occur below 3,000 feet and contain stems equal to or greater than one inch in diameter at ground level (table 3-33). The remaining five of the 14 elderberry shrubs are located above 3,000 feet elevation, outside of the known range for the VELB: (1) three shrubs (occurrences #3–5) were located at approximately 3,200 feet, in elevation near the Hendricks diversion dam along the West Branch Feather River, and (2) two of these shrubs (not included in table) are located well above 3,000 feet in elevation–one elderberry shrub (occurrence #2) was found near the east side of Philbrook reservoir at 5,560 feet, and a second shrub (occurrence #9) was located along Retson Road at 3,445 feet.

Table 3-33. Blue elderberry shrubs located during surveys and their physical characteristics. (Source: PG&E, 2007, section 6.7.2.2)

| | Occurrence # | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1** | **3** | **4** | **5** | **6** | **7** | **8** |
| **Location** | Riparian | Riparian | Riparian | Riparian | Riparian | Riparian/ Chaparral | Riparian/ Chaparral |
| **Elevation (ft)** | 1,640 | 3,200 | 3,200 | 3,200 | 1,120 | 2,200 | 2,280 |
| **Stems <1"** | 5 | 5 | 1 | 10 | 0 | 0 | 0 |
| **Stems ≥1" & <3"** | 3 | 0 | 1 | 0 | - | 2 | 2 |
| **Stems >3" & <5"** | 2 | 0 | 0 | 0 | 4[a] | - | - |
| **Stems >5"** | 0 | 0 | 0 | 0 | - | - | - |
| **No. of Plants** | 1 | 1 | 1 | 1 | 4[a] | 2 | 2 |
| **Exit Holes** | No | No | No | No | No | No | No |
| **VELB habitat** | Yes | No | No | No | Yes | Yes | Yes |

[a] These plants were inaccessible, located in a drainage below a suspended flume. These were good-sized shrubs that likely had stems between 3 to 5 inches in diameter. However, these shrubs were not directly examined.

Blue elderberry plants located during surveys appeared to be healthy. Occurrence #1 consisted of a small, heavily branched shrub that was growing in a disturbed area between the road leading to the Magalia diversion dam and the flume coming from the West Branch Feather River. Occurrence #6 consisted of four larger shrubs that were growing in an undisturbed thicket of riparian vegetation below a suspended flume. Occurrence #7 and #8 consisted of two shrubs each, and were located in openings near roadsides, but undisturbed. No exit holes attributable to VELB were observed at occurrences #1, #3–5, and #7–8. Because of limited access, occurrence #6 was viewed from a distance, not allowing the determination of the presence/absence of exit holes.

Inaccessible parts of the study area have the potential to support suitable VELB habitat but were not able to be surveyed. PG&E located blue elderberry shrubs upstream and downstream of bypassed reaches of the West Branch Feather River on Forest Service lands, totaling about 39.47 acres of potentially suitable habitat. PG&E also calculated that 39.85 acres along Butte Creek may support suitable habitat.

### California Red-legged Frog

The California red-legged frog is federally listed as threatened. The frog has specific aquatic and riparian components to its habitat requirements (FWS, 1996). Breeding sites are varied, including marshes, springs, permanent and semi-permanent natural ponds, ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds (FWS, 1997). Jennings and Hayes (1994) found they occur primarily in isolated ponds or pools of intermittent or perennial stream courses where water remains long enough for breeding and development of young. Dense, shrubby, or emergent riparian vegetation closely associated with deep (> 2.3 feet), still or slow-moving, water are needed during the November to March breeding season for attachment of egg masses and escape cover (FWS, 1996; Hayes and Jennings, 1988). Larvae remain in these aquatic habitats until metamorphosis, which typically occurs between July and September. Another key California red-legged frog habitat indicator is the absence or near-absence of predators such as bullfrogs and predatory fishes, particularly centrarchids (Jennings and Hayes, 1994).

Well-vegetated areas within the riparian corridor may provide important sheltering habitat in winter (FWS, 1996). Rocks, boulders, small mammal burrows, organic litter such as downed trees or logs, and leaf litter within 300 feet of riparian areas provide estivation habitat and refugia at anytime of the year (FWS 1996). Estivation habitat is used for relief from drought and predators and is essential for survival (FWS, 1996). During wet periods California red-legged frog can move long distances between aquatic habitats, traversing upland habitats or ephemeral drainages up to a mile from the nearest known frog populations (FWS, 1997).

PG&E conducted a preliminary California red-legged frog habitat evaluation (PG&E, 2007, section 6.3.2.1). PG&E identified several stock ponds downstream of Centerville; however, these areas were located on private property and permission to access the property was not granted. The DeSabla forebay was also initially selected as a potential lentic habitat for the frog. After a reconnaissance visit, however, it was deemed unsuitable due to heavy recreational use for angling, a lack of suitable aquatic or riparian vegetation, and the persistent stocking of trout, a known amphibian predator. No other California red-legged frog habitat was identified in the project area.

### Central Valley Spring-run Chinook Salmon ESU

Butte Creek spring-run Chinook salmon belong to the Central Valley evolutionarily significant unit (ESU) and are a California state- and federally listed threatened species. California listed the species as threatened in February 1999. They were federally listed shortly thereafter in September 1999 [Federal Register Vol. 64, No. 179]. Critical Habitat for Butte Creek was designated in February 2000 [Federal Register

Vol. 65, No. 32], and covers the reach downstream of Lower Centerville diversion dam to the confluence with the Sacramento River. In the project -affected reach, this includes Butte Creek from Lower Centerville diversion dam downstream to the Parrott-Phelan diversion dam.

The spring-run Chinook salmon is one of three runs occurring in Butte Creek, along with the fall- and late-fall runs. Because of its early migration timing, only the spring-run regularly utilize habitat upstream of the Parrott-Phelan diversion dam. The fall- and late-fall runs only rarely migrate up to or beyond the Parrott-Phelan diversion dam. Adult fall-run and late-fall-run Chinook salmon enter Butte Creek downstream of the project area primarily from October through February and spawn shortly thereafter. Juvenile fall-run and late-fall run Chinook salmon emigrate as both young-of-the-year and yearlings, and are not readily distinguishable from downstream migrant spring-run Chinook salmon.

Butte, Deer, and Mill creeks support the majority of self-sustaining Central Valley spring-run Chinook salmon. Between 1995 and 2002, Butte Creek supported an average of 70 percent of the total Central Valley spring-run population (low = 45 percent; high = 89 percent).

Until the early to mid-1990s, the spring-run Chinook salmon had been in substantial decline. During a 10 year period from 1956 through 1965, the annual spring-run Chinook salmon escapement (run size) averaged about 2,800 fish, with an estimated high of 8,700 fish in 1960. During the next three decades, annual spring-run escapement averaged approximately 337 (1966 to 1975), 162 (1976 to 1985), and 1,354 (1986 to 1995). Ten fish were estimated for 1979.

Modifications to project operations to benefit spring-run Chinook salmon beginning in the 1980s and restoration actions initiated in the early 1990s under the Central Valley Project Improvement Act, have resulted in large numbers of adult spring-run Chinook salmon returning to Butte Creek in recent years, far in excess of historical numbers and restoration expectations. According to the FWS report, Final Restoration Plan for the Anadromous Fishes Restoration Plan: January 9, 2001, the production goal for spring-run Chinook salmon in Butte Creek was 2,000 returning adults. Since 1991, the Butte Creek population of spring-run Chinook salmon has far exceeded that goal, averaging 5,254 returning fish. In 1998, a year characterized as a wet water year with above normal precipitation, the Butte Creek spring-run Chinook salmon escapement hit a record high (since the population was monitored) of 20,212 fish. Recent data suggest even more fish returned to Butte Creek in 2001, based on mark-recapture carcass count data. The most recent data for 2003 estimated that more than 17,000 fish returned to Butte Creek.

Adult spring-run Chinook salmon migrate from the ocean to the Sacramento River as immature fish beginning in early February, and arrive in Butte Creek in late February. The last adults to reach Butte Creek generally arrive by mid-June.

Prior to the installation of large dams, spring-run Chinook salmon used to migrate as far as they could travel in the large tributary streams to the Sacramento and San Joaquin Rivers. In most years, the upstream migration limit in Butte Creek is the natural barrier at Quartz Bowl. For the next several months, the fish hold in deep pool habitats primarily from the confluence of Little Butte Creek upstream to the Quartz Bowl while they mature.

During the summer, spring-run Chinook salmon do not feed and continue to mature in the deep pools before spawning. Due to the low elevation of the Butte Creek holding and spawning habitat, ambient stream temperatures often exceed the reported temperature tolerances of spring-run Chinook salmon; although severe heat storms can result in temperatures that lead to spring-run Chinook salmon mortality in Butte Creek.

For example, during the last two weeks of July 2003, air temperatures exceeded 37.6°C (100°F) for 10 of the last 14 days. These air temperatures were in the upper ten percent for the period of record. Consequently, water temperatures in key over-summer holding pools reached average daily temperatures of 20.9°C. The combination of the high numbers of returning adults confined to the limited number of holding pools and elevated air and water temperatures led to disease outbreaks of columnaris and ich (caused by the pathogens Flavobacterium columnare and lchthyophthirius multiphilis, respectively), resulting in pre-spawn mortalities. Despite the losses observed in 2003 (prespawning mortalities of approximately 11,231 fish out an estimated total population of 17,294 fish).

As temperatures cool in the fall, the mature fish move into nearby suitable spawning habitats. When suitable spawning habitat is found, female salmon dig nests called redds. Females then lay their eggs in the redds as the male fertilizes them. Once the eggs are covered with loose gravel and the spawning act is complete, the salmon die shortly thereafter. Eggs hatch after 40 to 60 days (depending on oxygen and temperature). The young fry remain in the gravel until their yolk sac is completely absorbed (4 to 6 weeks). Juvenile fish either emigrate shortly after emergence or rear in the stream up to 15 months. In Butte Creek, the fry begin their downstream emigration shortly after emerging from the gravel. Their downstream migration usually begins in mid-November and peaks between December and April. Between 1995 and 1998, and 1998 and 2000, 98.2 percent and 96.3 percent, respectively, of all YOY spring-run Chinook salmon emigrated between December 1 and January 31; the average length of fry was 36 mm fork length for both sampling periods. A lesser number of fry emigrated in late spring or early summer.

Sutter bypass serves as a major nursery to the emigrating Butte Creek spring-run Chinook fry [Hill and Webber 1999]. Butte Creek fry rear in Sutter bypass for a period of time before beginning their migration to the ocean. A small number of Butte Creek spring-run Chinook salmon emigrate as yearling fish (i.e., age 1÷) during the following fall and winter. Most yearling spring-run Chinook salmon emigrate in October, but a few may emigrate as late as April.

Historically, spawning adult Central Valley spring-run Chinook salmon were mostly large four or five year old fish. Based on the size of present-day spawners, three year old fish are now generally the most common. Likely the result of intense commercial fishing that removes the largest fish.

**Central Valley Steelhead ESU**

Steelhead are the anadromous form of rainbow trout. The Central Valley California ESU of steelhead trout is known to occur only in the Sacramento and San Joaquin rivers and their tributaries. The Sacramento and San Joaquin rivers provide the only migration route for anadromous fish to the drainages of the Sierra Nevada and southern Cascade mountain ranges. The Central Valley California ESU of steelhead trout, is federally listed as threatened [March, 1998, Federal Register Vol. 63, pages 32996 to 32998] but only for those runs in the Sacramento and San Joaquin Rivers and their tributaries.

Data on Butte Creek steelhead in the project area are restricted to limited visual observations by anglers and Cal Fish & Game game wardens. There are no estimates of steelhead numbers for Butte Creek. Scientific data for these fish are also scarce. Available data is limited to Cal Fish & Game sampling conducted in various years at the irrigation diversions downstream of the project. Several steelhead adults have been reported at the Parrott-Phelan diversion dam during Cal Fish & Game trapping efforts in the winter and spring for juvenile spring-run Chinook salmon. However, it is doubtful that steelhead or salmon regularly ascended beyond the Quartz Pool barrier and the present site of the Lower Centerville diversion dam.

In California, adult steelhead are typically three to four years old before returning to the stream to spawn in gravel redds from December though March. Steelhead trout are also capable of spawning more than once during their lifetime. Six to seven weeks after the eggs are laid the young fish emerge from the gravel. Juvenile fish generally spend their first 2 years residing in freshwater before smoltification and migrating to the ocean.

Steelhead are believed to ascend Butte Creek in the late fall and winter. Spawning likely takes place through the winter and into the spring (generally December through April), upstream of Helltown bridge. Steelhead prefer to spawn in clean gravel at the pool-riffle transition. There is often substantial gene flow between anadromous and

resident trout. It is not uncommon in anadromous steelhead for males to mature and then assume a resident life style.

**North American Green Sturgeon**

The Southern Distinct Population Segment of the North American Green Sturgeon (*Acipenser medirostris*) (green sturgeon) is federally listed as threatened (April 7, 2006, Federal Register Vol. 71, pages 17757 to 17766). Green sturgeon are anadromous and typically begin an upstream spawning migration into the Sacramento River in March. The Sacramento River is the only river known to have a spawning population of green sturgeon (NMFS, 2008). Spawning likely occurs from March and extends through early summer (Brown, 2007, as cited in NMFS, 2008). Adult green sturgeon have been observed in the upper Sacramento River, through November/December (NMFS, 2008), and as far upstream as the Keswick dam approximately 300 miles upstream of the mouth of the Sacramento River.[65] The upper Sacramento River is considered to be the primary spawning area for green sturgeon.

The lower Sacramento River serves as a migratory corridor for adult green sturgeon providing access to the upstream spawning grounds from the Pacific Ocean.[66] Additionally, while the upper Sacramento River serves as the primary spawning grounds for the green sturgeon, spawning also occurs within the lower Sacramento River along with egg incubation, larval and juvenile rearing, and seaward migration (NMFS, 2008).

More detailed general life history, biology, and status of the green sturgeon can be found in the Federal Register (68 FR 4433; January 23, 2003), in the Status Review (Adams et al., 2002), in the proposed Rule to list the Southern Distinct Population Segment of green sturgeon as threatened under the ESA (70 FR 17386; April, 6, 2005), and in the draft report *Proposed Designation of Critical Habitat for the Southern Distinct Population Segment of North American Green Sturgeon* (NMFS, 2008).

While no green sturgeon have ever been documented within the project area, the only known spawning population for the Southern Distinct Population Segment of green sturgeon can be found in the Sacramento River in California. As discussed above, spawning in the Sacramento River has been documented to occur as far upstream as Kesewick dam, approximately 300 miles from the mouth of the Sacramento River at the Pacific Ocean (NMFS, 2008). While fish have been observed at the mouth of some tributaries to the Sacramento River, no adults or sub-adults have been observed within

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[65] The upper Sacramento River is characterized as upstream of the Red Bluff diversion dam located at RM 243 to the Keswick dam located at RM 302 (NMFS, 2008).

[66] The lower Sacramento River is characterized as the reach of river from its mouth to the upstream Red Bluff diversion dam, located at RM 243.

any tributary to the Sacramento River, except for the lower Feather River (below Oroville dam).[67] Additionally, no juvenile, larvae, or green sturgeon eggs have been observed during surveys within any tributary to the Sacramento River (NMFS, 2008).[68]

Because green sturgeon do not occur in Butte Creek, or in proximity to the project area, relicensing the DeSabla-Centerville Hydroelectric Project with the staff recommended measures would have little, if any affect on the green sturgeon. However, the project does, provide for the inter-basin transfer of water from the West Brach Feather River to Butte Creek. This transfer of water would ultimately reduce the amount of flow in the Feather River downstream of the diversion. This inter-basin transfer of water occurs upstream of Lake Oroville. Given the presence, operation, and size of Lake Oroville, it is likely that any effects associated with the inter-basin transfer of the West Branch Feather River's water to Butte Creek would be attenuated downstream of Lake Oroville in the lower Feather River, where green sturgeon have been observed.[69]

#### 3.3.4.3 Environmental Effects

**Valley Elderberry Longhorn Beetle**

Routine operation and maintenance activities could affect elderberry shrubs that provide potential habitat for the VELB.

PG&E proposes to comply with the March 2003 Valley Elderberry Longhorn Beetle Conservation Program developed by PG&E and FWS (2003) to cover service area-wide maintenance activities. The conservation program requires PG&E to: (1) conduct pre-construction surveys, where necessary; (2) provide educational training for construction crews responsible for operation and maintenance activities; (3) implement minimization, avoidance, and protective measures; and (4) provide monitoring reports. FWS issued a biological opinion for actions that would be covered under the conservation program (FWS, 2003). This measure is consistent with Forest Service 4(e) condition 30 and FWS' 10(j) condition 11.

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[67] Oroville dam is part of the Commission licensed Oroville Facilities Project P-2100; the Commission is currently consulting with NMFS on the effects of the Oroville Facilities Project on green sturgeon.

[68] The Centerville powerhouse is the lowest most project facility in the Butte Creek watershed and is located approximately 50 river miles upstream of Butte Creek's confluence with the Sacramento River.

[69] More information on Lake Oroville and its operations can be found in the Commission's May 18, 2007, Final Environmental Impact Statement prepared for the relicensing of the Oroville Facilities Project (FERC, 2007).

*Our Analysis*

Some of the elderberry shrubs or habitat identified above may have to be trimmed during the term of the license (PG&E 2007c). Shrubs could also be damaged from vehicle use. Although there is no evidence of VELB use of the identified elderberry shrubs at this time, the VELB could colonize this habitat in the future.

The elderberry shrubs located along the DeSabla powerhouse Road and Retson Road, and near the Hendricks diversion dam may require occasional trimming in conjunction with roadside maintenance activities. In these cases, branches may be trimmed but it is unlikely that whole plants would be removed. The plants along Retson Road and near the Hendricks diversion dam, however, are located above 3,000 feet elevation, and therefore may not be VELB habitat.

Blue elderberry shrubs located near the Miocene diversion dam are located adjacent to a flume and an access road; this area also appears to have some recreation access. Given their location, these plants may also occasionally experience occasional disturbance due to regular maintenance activities. This disturbance would likely be limited to removing branches.

The elderberry shrubs located on the Lower Centerville canal are located well below a suspended flume in that area, and are unlikely to be disturbed by project operations and maintenance activities.

Inaccessible, unsurveyed areas that have the potential to support suitable VELB habitat are remote, and any blue elderberry plants in this area would be distant from any regular maintenance or operations activities. Any VELB in this area would be highly unlikely to have direct or indirect disturbance from project operation and maintenance.

Any effects to elderberry shrubs during the term of the license, which is expected to be limited, would be offset by that habitat acquired or developed under the conservation program. Training of maintenance workers and implementation of minimization and avoidance would reduce the likelihood of potential incidental take of the VELB.

**California Red-legged Frog**

Continued operation and maintenance of the project would not have any effects on the red-legged frog because of lack of habitat (see *Affected Environment* section above).

**Central Valley Spring-run Chinook Salmon and Steelhead ESUs**

Project operations and maintenance will influence and affect the quality and quantity of habitat for both, the Central Valley Spring-run Chinook Salmon ESU and the

Central Valley Steelhead ESU. The continue operation of the DeSabla-Centerville Hydroelectric Project is critical to the continued survival of these federally listed fish. The interbasin transfer of cold water from the West Branch Feather River to lower Butte Creek improves the habitat in lower Butte Creek and allows for tolerable habitat conditions during summer heat storms where otherwise none would exist.

As discussed in section 3.3.2.2, providing greater minimum instream flows below the Centerville diversion dam would increase the amount of available spawning and holding habitat there, but would also influence water temperature downstream of the Centerville powerhouse where the bulk of the spawning habitat is located. Removal of the Lower Centerville diversion dam would have similar results in that following its removal, cold water could no longer be delivered to lower Butte Creek via the Centerville powerhouse, limiting the extent of the cold water habitat for the Chinook salmon and steelhead.

As discussed in greater detail in section 3.3.2.2, implementing a long-term operations plan as proposed by PG&E and recommended by the agencies and the Conservation Groups would allow for project operations to manipulate the timing and location of the delivery of West Branch Feather River water to address water temperatures and the habitat needs of the federally listed fish. Under current conditions, and the proposed project, water could be delivered to lower Butte Creek via spill at the Lower Centerville diversion dam, or further downstream via the Centerville powerhouse tailrace, a release point that would extend the downstream extent of the cold water habitat in lower Butte Creek.

Providing higher minimum instream flows to the West Brach Feather River downstream of the Hendricks diversion dam and also within the feeder tributaries that feed the Hendricks/Toadtown canal, as discussed in section 3.3.2.2, would result in less cold water being available to lower Butte Creek and could result in warmer water temperatures potentially negatively effecting the quality and quantity of the Chinook salmon and steelhead habitat downstream of the Lower Centerville diversion dam.

However, installation of the DeSabla forebay water temperature improvement facility to reduce thermal loading in DeSabla forebay by either 50 or 80 percent would improve water temperatures downstream of the forebay thereby benefiting the listed fish in lower Butte Creek.

We present our final recommendations pertaining to all Aquatic Resources including those that may affect Chinook salmon and steelhead in section 5, *Conclusions and Recommendations*.

#### Future Consultation and Protection

Protection, mitigations, and consultation concerning new activities or newly listed species and annual consultation for federally listed species is discussed in section 3.3.3.2, *Terrestrial Resources*, under *Special-status Species*.

### 3.3.5 Recreation Resources

#### 3.3.5.1 Affected Environment

#### Regional Recreation Resources

The DeSabla-Centerville Hydroelectric Project is located on lands within the Lassen and Plumas National Forests. The Lassen National Forest, totaling 1.2 million acres, provides a variety of recreational opportunities such as camping, fishing, hunting, picnicking, off-road vehicles areas, biking, whitewater boating, and more than 460 miles of hiking trails, including 120 miles of the Pacific Crest National Scenic Trail that passes through the Lassen Volcanic National Park. The Lassen National Forest hosts nearly one million visitors per year.

The Lake Oroville State Recreation Area and Paradise Lake are other recreation areas located outside of the project area, but within the project region. Lake Oroville is located 30 miles south of the project. The lake consists of 167 miles of shoreline and offers camping, picnicking, horseback riding, hiking, boating, water-skiing, fishing, and swimming. Lake Oroville State Recreation Area has a visitor center, swimming areas, marinas, day-use areas, picnic areas, a fish hatchery, three developed boat launches, five undeveloped boat launches, boat docks, parking, and house boat rentals that have made it a regionally significant recreation destination. Paradise Lake is also located just 20 miles south of the project and offers activities such as picnicking, biking, hiking, and fishing. The lake also includes a scenic 4.5-mile-long trail paralleling its north shore.

Further boating opportunities can be found below the project area, roughly 2.3 miles downstream of the Miocene diversion on the West Branch Feather River. Ben & Jerry's Gorge Whitewater Run is a Class V+ whitewater boating run and is approximately 4 miles in length. However, the reach is one of many whitewater boating runs within the region.

The Upper Butte Creek Watershed is located upstream of the project and offers several public recreation opportunities, including camping, fishing, cross-country skiing, winter ORV opportunities, biking, hiking, and equestrian opportunities. Additionally, several ecological reserves and wildlife areas are also located in the vicinity of the project. Coon Hollow Wildlife Area, Butte Creek House Ecological Reserve, and Butte Creek Canyon Ecological Reserve are within the project region and offer public opportunities for fishing, hiking, deer hunting, and wildlife viewing.

**Project Area Recreation Resources**

There are two developed recreation areas within the project boundary: Philbrook reservoir recreation area and DeSabla forebay recreation area (figure 3-49). There are dispersed camping and hunting opportunities at a third project reservoir, Round Valley reservoir, but no developed facilities. Additionally, fishing and hiking access exists along the Hendricks, Butte, and Lower Centerville canals; however, these trails are meant to be used by PG&E for project maintenance purposes.

Recreation use also occurs along several of the river reaches associated with the project, including the upper and lower reach of the West Branch Feather River, Philbrook Creek, and Butte Creek. These reaches are primarily accessed for fishing; however, other recreation activities including hunting, hiking, dispersed camping, and whitewater boating does occur. There are approximately four whitewater boating runs within the project vicinity.

*Philbrook Reservoir Recreation Area*

At full pool, Philbrook reservoir has a surface area of 173 acres, a maximum depth of 60 feet, and 3 miles of shoreline. Camping, boating, picnicking, swimming, and fishing are the primary recreational activities that occur at this reservoir. Largemouth and smallmouth bass, channel catfish, brown trout, rainbow trout, and eastern brook trout can be found in the reservoir and the Cal Fish & Game annually stocks the reservoir with catchable trout. The majority of boaters that use Philbrook reservoir are anglers. Most boats on the reservoir are primarily smaller, low or non-powered watercraft, but occasionally speed boats and personal watercrafts have been observed. Motorized boats may be prohibited on lakes with surfaces less than 300 acres by Butte County ordinance, if appropriately posted. There is no signage currently posted at Philbrook reservoir prohibiting the use of motorized boats.

The primary recreation season begins in mid-May and ends in mid-September; however, the beginning of the reservoir recreation season is dependent on the timing of the snowmelt runoff. Philbrook reservoir usually fills up by the end of May, but on occasion, the reservoir has not filled up until the beginning of June. Although PG&E's annual operation and maintenance plans require the reservoir to be drawn down at a relatively constant rate during the summer, PG&E normally maintains the reservoir elevation above 5,516 feet msl until mid-September.

Philbrook Campground is located along the middle of the reservoir's North shore and consists of 20 campsites, potable water, restrooms, and includes access to fishing and swimming. Each campsite includes a picnic table, fire ring, and parking spur. The campsites can accommodate recreation vehicles (RV) and trailers up to 40 feet in length, but there are no utility hookups available at the campground.

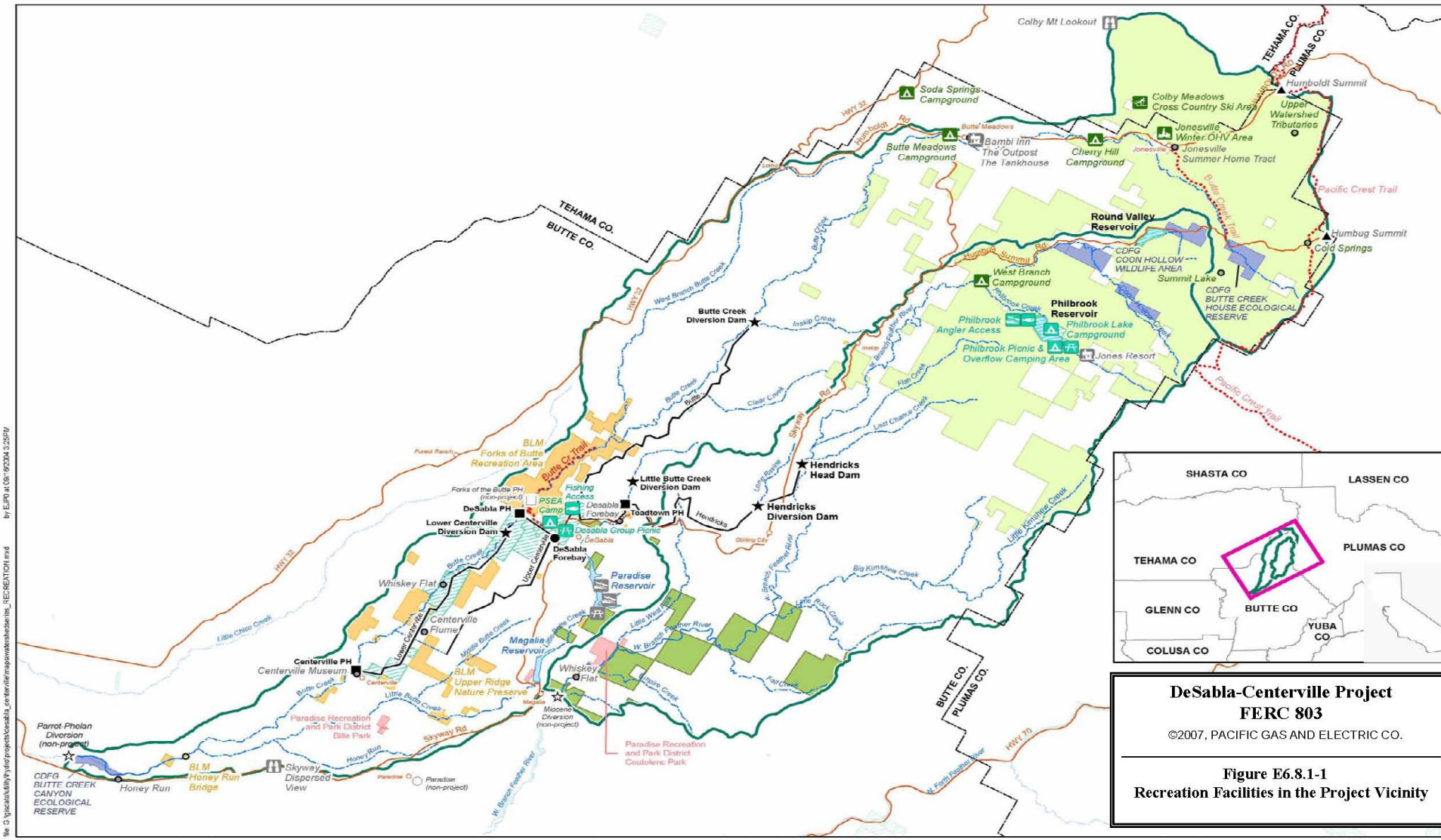


Figure 3-49. Recreational facilities in the vicinity of the DeSabla-Centerville Hydroelectric Project. (Source: PG&E, 2007)

Philbrook Picnic and Camping Overflow Area is located on the northeast shore and consists of five picnic tables, five parking spots, a double-vaulted restroom, and access to fishing and swimming. During peak use periods, the picnic sites serve as overflow campsites for Philbrook Campground.

Philbrook Angler Access is located adjacent to the spillway on the northwest and includes a small watercraft launch, vaulted restrooms, and 20 parking spots. Access is used primarily for boat launching, although some dispersed use does take place. Additionally, PG&E has issued 21 private residential boat dock permits on the east end of the reservoir. Although these docks are permitted to private owners, the docks are within the project boundary and therefore open to public use.

*Non-project Recreation Facilities near Philbrook Reservoir*

Some additional dispersed camping occurs at the Willows Area along Philbrook Creek, just 0.5-mile east of Philbrook reservoir. This area was previously the location of the Forest Service's Philbrook Creek Campground, which was used as a camping overflow area for large groups. On the east side of Philbrook reservoir there are 42 private summer homes located just outside the project boundary and Jones Campground, a privately owned group campground.

*DeSabla Forebay Recreation Area*

DeSabla forebay is a small forebay with a surface area of 15 acres and 1 mile of shoreline. This forebay is popular fishing spot with local residents. Public shoreline use primarily occurs on the east shore of the reservoir near the dam and parking is provided for a minimum of 20 vehicles. An accessible fishing site is also located at the northeastern end of the shore. PG&E provides funding for Cal Fish & Game to stock the forebay every other week with catchable sized trout during the spring and summer, as well as other areas in Butte Creek as a part of a 1983 agreement. Non-power and low-power boats have been observed using the forebay, however, as with Philbrook reservoir, there is no signage posted prohibiting the use of motor boats. Parking for a minimum of 20 vehicles is located on the east shore. Additionally, PG&E has permitted a courtesy dock to a private organizational campground adjacent to the reservoir's western shoreline within the project boundary.

DeSabla Group Picnic Area is located on the east side of Skyway Road, across from DeSabla forebay. This area is open during the primary recreation season and provides a group barbeque, picnic tables, running water, and a public vault toilet facility.

*Non-project Recreational Facilities near DeSabla Forebay*

Pacific Service Employees Association's Camp DeSabla is located on the western shore of DeSabla forebay and consists of 17 cabins privately owned and operated by the

Pacific Service Employees Association just outside the project boundary. This camp is open from early April through mid-October.

**Recreation Use and Facility Capacity**

Recreation use within the project boundary occurs at the two developed recreation areas, Philbrook reservoir and DeSabla forebay, and at undeveloped areas, including Round Valley reservoir and several of the project streams.

In 2006, PG&E estimated use based on the extrapolation of visitor counts at project reservoir recreation areas and project streams. The study evaluated the number of people at one time at each recreation area. PG&E relied on both visitor and vehicle data to estimate annual, peak, and off-peak season recreation days at each site (table 3-34). PG&E defines the peak recreation season as May 28 through September 19, 2006 for all sites, except the high elevation sites, which started on June 15 due to the late snowpack. The off-peak season was from September 20 through May 27, 2006, which included the opening fishing weekend, April 29 and 30, 2006.

Table 3-34. 2006-2007 project area use estimates for the DeSabla-Centerville Hydroelectric Project area by resource area (within the FERC project boundary). (Source: PG&E, 2007)

| Resource Area | Annual Estimate | Peak Estimate | Off-Peak Estimate |
|---|---|---|---|
| **Project Reservoirs** | | | |
| Philbrook reservoir | 4,957 | 4,957 | Not Applicable |
| DeSabla forebay | 2,868 | 907 | 1,961 |
| Round Valley reservoir | 218 | 218 | Not Applicable |
| **Total** | **8,042** | **6,082** | **1,961** |
| **Project Canals** | | | |
| Butte Creek canal | 3,020 | 1,118 | 1,901 |
| Hendricks-Toadtown canal | 1,886 | 587 | 1,298 |
| Upper Centerville canal | 0 | 0 | 0 |
| Lower Centerville canal | 2,146 | 823 | 1,323 |
| **Total** | **7,051** | **2,529** | **4,523** |
| **Project Total** | | | |
| **Project Use Estimate** | **15,094** | **8,610** | **6,483** |

It was estimated that more than 15,000 people visited the DeSabla-Centerville Hydroelectric Project recreation areas in 2006, with over 50 percent of the visitation occurring at the two project-developed recreation areas, Philbrook reservoir and DeSabla forebay. Philbrook reservoir was the most popular place to recreate at the project receiving nearly 5,000 (62 percent) recreation days during the peak season.

Project canals had an estimated 7,051 recreation days for overall annual visitation. Most recreation users visited the canals during the off-peak season (64 percent) compared to visitation during the peak season. Butte Creek canal had the greatest estimated use with more than 3,000 recreation days, followed by Lower Centerville and Hendricks-Toadtown canal. There was no recreation use estimated at the Upper Centerville canal due to no vehicles being observed at the public access trail locations. Visitor and resident surveys indicated however, use of the canal trail for recreation via non-public lands surrounding the project.

Overall visitation was estimated at 23,725 recreation days with 77 percent of the visitation occurring during the peak season (table 3-35). Lower Butte Creek accounted for 78 percent of the annual use compared to about 11 percent estimated annual use on both the West Branch Feather River/Philbrook Creek and Butte Creek Canyon.

Table 3-35. 2006-2007 project area use estimates for resource areas along project-affected river reaches (outside the FERC project boundary). (Source: PG&E, 2007)

| Resource Area | Annual Estimate | Peak Estimate | Off-Peak Estimate |
|---|---|---|---|
| **Project Streams** | | | |
| West Branch Feather River/ Philbrook Creek | 2,706 | 2,549 | 157 |
| Butte Creek Canyon | 2,586 | 1,372 | 1,197 |
| Butte Creek Lower | 18,451 | 14,390 | 4,061 |
| **TOTAL** | **23,725** | **18,311** | **5,414** |

Through the visitor and resident recreation study, PG&E found that an overwhelmingly amount of visitors come from Butte County to use the project for recreation. The Butte County population is expected to increase through 2050 at a consistent rate of about 25 percent per decade. As a result, project recreation use would likely double. The 2006 estimates of existing recreation use were used to estimate future use at the project (table 3-36).

Table 3-36. Projected estimated annual recreation use at project resource areas through 2050 based on the expected population growth rate of Butte County. (Source: PG&E, 2007)

| Resource Area | 2006-07 | 2010 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|
| *Butte County Growth Rate*[a] | -- | *1.13* | *1.38* | *1.64* | *1.9* | *2.16* |
| **Reservoirs** | | | | | | |
| Philbrook | 4,957 | 5,601 | 6,840 | 8,129 | 9,418 | 10,706 |
| DeSabla forebay | 2,868 | 3,240 | 3,957 | 4,703 | 5,448 | 6,194 |
| Round Valley | 218 | 246 | 301 | 358 | 414 | 471 |
| Total | 8,042 | 9,088 | 11,098 | 13,189 | 15,280 | 17,371 |
| **Canals** | | | | | | |
| Butte Creek Canal | 3,020 | 3,412 | 4,167 | 4,952 | 5,737 | 6,523 |
| Hendricks/Toadtown Canal | 1,886 | 2,131 | 2,602 | 3,092 | 3,583 | 4,073 |
| Upper Centerville Canal | 0 | 0 | 0 | 0 | 0 | 0 |
| Lower Centerville Canal | 2,146 | 2,425 | 2,962 | 3,520 | 4,078 | 4,636 |
| Total | 7,051 | 7,968 | 9,731 | 11,564 | 13,398 | 15,231 |
| **Project Total** | | | | | | |
| | 15,094 | 17,056 | 20,829 | 24,754 | 28,678 | 32,602 |

[a] California Department of Finance, Economic Research (accessed at www.dof.ca.gov).

Although recreation use at the project is expected to double, no developed recreation facilities at the project will be approaching full capacity by the year 2050 (table 3-37). Philbrook Campground will be approaching only two-thirds of its physical capacity and both the DeSabla Group Picnic Area and Philbrook Campground Overflow will only be approaching 10 percent of capacity. Currently, overall parking capacity at the project is at 24 percent, with the highest occupancy occurring on holidays with 56 percent capacity. Parking is expected to approach 60 percent capacity by 2050, with the likeliness of holidays reaching 100 percent capacity.

Table 3-37. Projected occupancy at project recreation facilities at project reservoir facilities through 2050 based on the expected population growth rate of Butte County. (Source: PG&E, 2007)

| Resource Area | 4-Year Average (2003-2006) | 2010 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|
| *Butte County Growth Rate*[a] | -- | *1.13* | *1.38* | *1.64* | *1.9* | *2.16* |
| Philbrook Campground | 30% | 34% | 41% | 49% | 57% | 65% |
| Philbrook Campground Overflow | 3% | 3% | 4% | 5% | 6% | 6% |
| DeSabla Group Picnic Area | 4% | 5% | 6% | 7% | 8% | 9% |

[a] California Department of Finance, Economic Research (accessed at www.dof.ca.gov).

**Whitewater Boating**

In 2006, PG&E conducted a recreation flow study to describe the relationship between flows and water-based recreation opportunities within the project area through a literature review and interviews of individuals knowledgeable about whitewater boating opportunities in the region. Several reaches were identified in relation to whitewater boating opportunities, as summarized in table 3-38.

Table 3-38. Recreation flow study reach segments and sites by project-affected reach. (Source: PG&E, 2006)

| Project-Affected Reach | Length (miles) | Study Segments | Length (miles) |
|---|---|---|---|
| Butte Creek: Butte Creek diversion dam to DeSabla powerhouse | 10.0 | Butte Creek diversion to Doe Mill Creek Road | 6.7 |
| | | Doe Mill Creek Road to DeSabla powerhouse | 3.3 |
| Butte Creek: DeSabla powerhouse to Centerville powerhouse | 6.5 | DeSabla powerhouse to Centerville powerhouse | 6.5 |
| Butte Creek: Centerville powerhouse to Parrott-Phelan diversion | 9.0 | Centerville powerhouse to Centerville Bridge | 0.3 |

| Project-Affected Reach | Length (miles) | Study Segments | Length (miles) |
|---|---|---|---|
| | | Centerville Bridge to Covered Bridge | 5.3 |
| | | Covered Bridge to Parrott-Phelan diversion | 3.4 |
| Upper West Branch Feather River | 14.5 | Round Valley Dam to Philbrook Creek | 4.9 |
| | | Philbrook Creek to Brown's Ravine Bridge | 3.5 |
| | | Brown's Ravine Rd. to Hendricks diversion dam | 6.1 |
| Philbrook Creek | 2.3 | Philbrook reservoir dam to West Branch Feather River confluence | 2.3 |
| Lower West Branch Feather River | 14.0 | Hendricks diversion to Robley Point Rd. Bridge | 5.9 |
| | | Robley Point Rd. Bridge to Whiskey Flat | 7.3 |
| | | Whiskey Flat to Miocene diversion | 0.8 |

Beginner to advanced whitewater boating opportunities can be found throughout the project. On Butte Creek, a 3.5-mile-long, Class VI whitewater boating run exists between Doe Mill Bridge and the DeSabla powerhouse. There is also a 6.2-mile-long whitewater boating opportunity from DeSabla powerhouse to Centerville powerhouse during the winter and spring season with an estimated annual whitewater boating useage of 400 recreation days.[70] This run can be divided into three sections. The upper section from DeSabla powerhouse to Chimney Rock is a Class V run; the middle section from Chimney Rock to Helltown is a Class IV run; and the lower section from Helltown to Centerville powerhouse is a Class III+/IV- run. On the lower reach of Butte Creek there are two popular beginner/intermediate whitewater runs available during spring to early summer. The first run is a 6-mile-long, Class II+ run, extending from Centerville powerhouse to the Honey Run Bridge. The second run is a 3-mile-long, Class II run, extending from the Honey Run Bridge to the Parrott-Phelan diversion dam. Annual whitewater boating use at this lower reach is estimated at 410 recreation days. Other boating opportunities can be within the Forks of Butte Creek Recreation Area. The

[70] One recreation day equals one recreation participant per day.

boating put-in for this Class IV-V kayaking run on the West Branch Feather River can be found near Whiskey Flat.

#### 3.3.5.2 Environmental Effects

**Recreation Management Plan**

In order to ensure a quality experience for recreation users over the term of the license, PG&E proposes to develop and implement a recreation facility rehabilitation and ADA upgrade plan for the existing recreation facilities at Philbrook reservoir and DeSabla forebay within 1 year of license issuance. The plan would include replacing, retro-fitting, and upgrading existing recreation facilities, as needed, and improving access by providing ADA facility enhancements, as necessary, according to Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) and ADA standards over the term of the new license. PG&E also proposes to continue to operate, manage and maintain recreation facilities at Philbrook reservoir and DeSabla forebay by conducting minor repairs and preventative, annual maintenance activities.

Forest Service (4)e condition 33 specifies that PG&E implement a recreation management plan in consultation with the Forest Service and other appropriate agencies to include annual maintenance, operation, reconstruction, and monitoring of existing recreation facilities and use at the project to protect natural site conditions and promote user convenience. Under 10(a) recommendation 17, FWS also recommends PG&E implement a recreation plan.

The following sections describe the components of each recreation plan proposed by PG&E, the Forest Service, and FWS and our assessment of the potential effects of each plan on recreational resources at the DeSabla-Centerville Hydroelectric Project.

**Rehabilitation and Enhancements**

As a part of its recreation plan, PG&E proposes to upgrade or replace existing recreation facilities that have deteriorated and bring all recreational facilities at Philbrook reservoir and DeSabla forebay up to an accessible level. PG&E provides a summary of the anticipated rehabilitation measures at each site, which we summarize below.

*Developed Recreation Facilities at Philbrook Reservoir and DeSabla Forebay*

- Philbrook Day Use and Overflow Camping Area: rehabilitate 1 picnic site, 1 restroom, and 1 parking space to be universally accessible; provide accessible route between existing restrooms, parking area, and accessible picnic sites.

- Philbrook Angler Access: rehabilitate 1 restroom and parking space to be universally accessible

- Philbrook Campground: rehabilitate 4 campsites (2 RV sites), 2 restrooms, and 1 overflow parking spaces to be universally accessible; provide accessible route between restrooms, parking area, and accessible campsites.

- DeSabla forebay: rehabilitate 1 parking space to be universally accessible; provide accessible route between parking area, proposed restroom, and shoreline.

- DeSabla Group Picnic Area: rehabilitate 1 parking space, 1 cooking grill, and 20% of picnic tables to be universally accessible and adjacent to an accessible route; provide an accessible route between parking area, restroom, and picnic tables/area.

The above ADA measures were also recommended by CSSA.

The Forest Service's recreation plan also specified PG&E rehabilitate existing facilities on National Forest System lands and improve access by making developed recreation sites accessible to the physically challenged according to FSORAG guidelines in its 4(e) condition 33. We summarize the rehabilitation measures specified by the Forest Service below.

*Developed Recreation Facilities at Philbrook Reservoir*

- Extend concrete boat launch to "normal fall" pool level with concrete or other permanent hardened surface.

- Reconstruct restrooms to meet FSORAG guidelines

- Construct accessible designated trail(s) to shoreline through campground

- Construct and maintain public recreation trail from new Forest Service access road and parking area to the southeast shoreline of Philbrook reservoir

- Install signage inviting public to access project shore.

- Provide 15-20 percent of the camping fees collected from National Forest System lands at Philbrook Campground to provide for compliance inspections, interpretation, and a Forest Service presence at the campground.

- Consider placing a portion of the Philbrook Campground under a reservation system to encourage trip planning and guarantee a space.

- Consider working in partnership with local communities and agencies to recruit disadvantaged youth to participate in "Kids in the Woods" or like programs.

*River Reaches*

- Upgrade and maintain an existing user-created trail and parking along Toadtown canal east of HT 1 and HT 2 and parking area; provide a barrier at end of trail to discourage trespass.

- Manage invasive weeds along designated trails.

FWS recommends PG&E develop a separate site plan specifically for the Forks of Butte Creek Recreation Area in its 10(a) condition 18 recommendation. FWS provided the following recommendations to improve access and enhance recreation opportunities to these areas:

*Forks of Butte Creek Recreation Area*

- Construct an accessible restroom at the Forest of Butte Creek Campground.

- Develop a site plan for the Forest of Butte Creek Primitive Campground to include a toilet, fire rings, picnic tables, bear boxes, parking and tent site.

- Construct an accessible restroom at Ponderosa Bridge Parking Area

- Complete construction of the Butte Creek Trail on southwest shoreline of Butte Creek to Canyon Bottom; build a footbridge across Butte Creek to connect the trail.

- Manage fires/dispersed use around recreation area through project patrol

- Install kiosk and reconstruct trail alignment at Indian Springs Trailhead.

*Our Analysis*

PG&E's proposed rehabilitation measures include upgrading existing facilities and improving accessibility at various times over the new license. These measures would provide for enhanced access to project facilities, trails, restrooms, campsites and amenities, picnic areas and amenities, and parking. Improving access for the disabled at the project would be consistent with the Commission's policy on recreation facilities at licensed projects under which licensees are expected to consider the needs of the design and construction of such facilities. These measures would provide enhanced accessibility to recreation opportunities at the project over the term of a new license.

PG&E's proposal is consistent with the Forest Service's 4(e) condition 33, but the Forest Service's condition contains a few additional measures that PG&E did not propose. The Forest Service specified PG&E extend the concrete boat launch on Philbrook reservoir to "normal fall" pool level due to public concerns with the boat launch, consistent with the State Water Board's recommendation in its comments filed February 27, 2009. Currently, the boat launch is operational throughout the primary recreation season (Memorial Day weekend to mid- to late September); however, it does not extend to the low water line. PG&E states Philbrook reservoir is maintained at a minimum elevation of 5,516 feet elevation during the primary recreation season and the boat launch is still functional at this level due to the soil being compacted, benched, and cleared of debris to the low water line. Forest Service states stumps in the reservoir bottom, erosion from vehicle traffic, and rutting have been identified by the public at low pool. The State Water Board also commented that when Philbrook reservoir is drawn down, vehicles must navigate between large rocks in a circuitous path to reach the reservoir, which results in erosion in the exposed lake bottom. Based on the Visitor and Resident Recreation Survey conducted by PG&E in 2006, Philbrook reservoir was by far the most popular reservoir at the project. Approximately 37 percent of those recreation users visiting the Philbrook reservoir recreation area accessed the boat launch during the peak recreation season. Demand for boating access coupled with the current condition of the boat launch demonstrates the need for adequate recreational boating access at the project.

Forest Service specified PG&E to fund and Forest Service to install restrooms, at $40,000 each in 2008 dollars) to meet Forest Service guidelines at the Philbrook reservoir day use area and boat launch within 1 year of license issuance. Installing new restrooms at the Philbrook reservoir area would improve the current recreation facilities, however, we note that a licensee cannot satisfy the obligation to perform certain tasks by a simple payment to another party, nor can the obligation be limited by a particular dollar figure. Ultimately, PG&E would be responsible for installing and maintaining new restrooms at the Philbrook reservoir day use area and boat launch.

Forest Service specified PG&E upgrade and maintain an existing user-created trail and parking along Toadtown canal and manage invasive weeds along designated trails at the project. Upgrading the existing trail and parking would provide enhance accessibility to recreation opportunities at the project and would help ensure that project recreation facilities meet future recreation demand over the term of the license. PG&E has proposed a noxious weed management plan to include managing invasive weeds along recreation trails, which is further discussed under *Terrestrial Resources*, section 3.3.2.1.

In addition, the Forest Service specified PG&E construct and maintain a public recreation trail to the southeast shoreline of Philbrook reservoir from each of the three Forest Service provided parking areas off a newly constructed Forest Service road (map provided by the Forest Service filed June 26, 2009, by FERC). The Forest Service is

currently developing an environmental document for a timber sale in the vicinity of Philbrook reservoir, which requires the Forest Service to reconstruct roads across National Forest System lands that currently access PG&E leased recreation cabins on the southeast shoreline. The Forest Service states the intent of this condition is to clearly indicate, via a pathway, where it is appropriate for public to travel to get from the Forest Service provided parking area(s) to the project shoreline, through the private cabins, decreasing conflicts with the private cabin owners. Providing trails to the southeast shoreline would improve access by designating a pathway for public use from the three new parking areas that will be constructed by the Forest Service as a part of a timber sale without conflicting with the existing cabin user needs.

The Forest Service specified PG&E provide the Forest Service with 15-20 percent of the camping fees collected from National Forest System lands at Philbrook Campground for compliance, interpretation, and Forest Service patrol and to consider placing a portion of the Philbrook Campground under a reservation system. Forest Service stated in its comments filed February 27, 2009, they are concerned that without any way to secure alternate funding for these facilities, the Forest Service would not be able to provide interpretive programs or other opportunities at this facility that are not addressed by the license condition. All the campsites at Philbrook Campground, with the exception of one, are located on National Forest System lands. Placing Philbrook Campground under a reservation system might make it easier for visitors to reserve a camp site. We note, PG&E has been and continues to be responsible for the operation and maintenance of recreation facilities within the project boundary. Furthermore, any camping fees collected at Philbrook Campground would be under the jurisdiction of the Licensee to use toward costs associated with the operation and maintenance of the campground. Although providing interpretive programs at Philbrook would enhance the public's knowledge and use of the recreation resources at the project, the campground has an occupancy rate of only 34% year round. Therefore, we do not feel it necessary to require interpretive programs at the campground as a part of the license, nor do we feel it appropriate to require PG&E to provide funding to the Forest Service for such programs.

FWS recommended a separate site plan for the Forks of Butte Creek Recreation Area located outside the project boundary. PG&E is currently meeting camping needs and providing public access to project lands and waters by the use of both the Philbrook and DeSabla recreation areas. Although developing rehabilitation and enhancement measures to improve recreation at Forks of Butte Creek campgrounds, the Ponderosa Bridge Parking area, and the Butte Creek trail would enhance accessibility to recreation opportunities, these facilities are located outside the project boundary and are not needed for project purposes.

CSSA recommends that PG&E construct a public day use area with ADA accessible facilities Round Valley reservoir (Snag Lake), and stock the reservoir with trout during the spring season. Under current project operations, this reservoir is filled to

its maximum level during the spring of each year and then drained completely in June. There are no fish currently stocked at this reservoir and there is little to no recreation use in this area of the project. Although constructing a public day use area and stocking the reservoir with fish would improve recreation opportunities at Round Valley reservoir, there is no evidence to support the need for developed recreation facilities in this area of the project.

**Operation and Maintenance**

PG&E proposes to develop a recreation operation plan, in consultation with the Forest Service, for recreation facilities within the project boundary at Philbrook reservoir and DeSabla forebay within 1 year of license issuance. PG&E agrees to provide a draft to the Forest Service for a 60-day review period before it would file the plan with the Commission.

Forest Service (4)e condition 33 specifies that PG&E address the roles and responsibilities between them and the Forest Service pertaining to coordination, user fees, user conduct and safety, annual inspections, annual operation and maintenance, trigger points initiating environmental analysis, and implementation of additional recreation mitigation. These measures would be developed in a plan and the plan would be reviewed and updated every 5 years, at minimum.

*Our Analysis*

PG&E is responsible for the management, operations, and routine maintenance of the recreation facilities within the project boundary. Operation and Maintenance associated with the project's recreation facilities help to ensure that these facilities and associated public recreational access are provided over the term of the license. Development of the plan in consultation with the Forest Service would help to address Licensee and Forest Service responsibilities. Submittal of a final plan to the Commission for review and approval after consultation with the Forest Service would help to ensure that the proposed operation and maintenance measures are consistent with the terms and conditions of a new license.

**Dispersed Camping and OHV Use**

Besides the trash management measures that are already occurring through the operation and maintenance of the current license, PG&E proposes to work with the Forest Service to discourage dispersed camping, trash dumping, and OHV use through a combination of appropriate signage and installation of adequate vehicle barriers, specifically at the Willow Dispersed Area. Alternatively, PG&E proposes to close this area to motor vehicles only, as opposed to closing the recreation area completely.

In addition to PG&E's proposal, Forest Service specifies PG&E manage dispersed recreation and OHV use around the project, including at Round Valley reservoir, Willow Dispersed Use Area, the West Branch Feather River Bridge crossing, and the former West Branch Campground site. This would include installing boulders or barriers to block vehicle access in these areas, installing signs for pack-in/pack-out and appropriate sanitation, and redirecting displaced campers to acceptable camping locations. Specifically for OHV use, PG&E would be required to construct kiosks displaying regulatory information about OHV use in approved locations, redirect waterflow and revegetate where OHV use has compacted or damaged natural resources, close and rehabilitate unauthorized OHV routes, and develop mitigations to minimize OHV resource impacts on adjacent lands as some areas become restricted.

Further, both the Forest Service specifies and Butte County recommends PG&E manage dispersed use around the recreation area through project patrol.

*Our Analysis*

Measures to block vehicle access and discourage dispersed camping and OHV use at the project would benefit environmental resources by closing degraded areas to more intense recreational use. The applicant would continue to allow appropriate non-motorized access to all existing and future project lands except where unsafe. By implementing additional visitor management controls where needed, such as signs, barriers, and enforcement, this would ensure a high quality recreational experience and enhance public safety. The Willows Dispersed Area, the West Branch Feather River Bridge crossing, and the former West Branch Campground site are all located outside the project boundary. PG&E is ultimately responsible for the operation and maintenance of the project's recreation facilities located within the project boundary. The Willows Dispersed Area, the West Branch Feather River Bridge crossing, and the former West Branch Campground site are all located outside the project boundary, but due to their close proximity to the reservoir, it is likely visitors to the project are utilizing these areas and these one-time measures would be appropriate. The provision of providing project patrol is further discussed later on in this section.

**Fish Stocking**

One of the primary recreational activities associated with the project includes angling. Cal Fish & Game currently stocks DeSabla forebay to improve the recreational fishery. PG&E proposes to continue to fund Cal Fish & Game up to $10,000, approximately 3,311 pounds of trout, annually in years in which Cal Fish & Game stocks rainbow trout in DeSabla forebay. Cal Fish & Game contends that under a 1983 agreement with PG&E, the applicant agreed to annually reimburse Cal Fish & Game for the stocking of 14,435 trout, or approximately 7,200 pounds.

*Our Analysis*

Angling is one of the most popular activities associated with the project and because DeSabla forebay is a popular fishing spot with local residents, stocking catchable trout would help ensure that the recreational fishery is maintained for the term of the new license. However, based on the recreation studies completed through the relicensing process, there is no evidence that would support increasing the number of fish stocked at the project currently. Staff recommends PG&E develop a fish stocking plan after consultation with Cal Fish & Game to include the amount and location of fish to be stocked at DeSabla forebay, Philbrook reservoir, and other affected stream reaches at the project. We also recommend that PG&E conduct creels surveys through the recreation monitoring to evaluate angler satisfaction, as discussed in the *Recreation Monitoring* in section 5.2.2. This is consistent with Cal Fish & Game's 10(j) recommendation as resolved during the April 13, 2009, 10(j) meeting (see section 5.4, *Summary of Section 10(j) Recommendations and 4(e) Conditions*).

Development of a fish stocking plan, after consultation with Cal Fish & Game, would provide the means for coordinated development of the amount and location of fish to be stocked in project- affected waters. In addition, conducting creel surveys on a five year basis as a part of recreation monitoring at the project would help to identify changes in trends and use patterns at the project and ensure current angler satisfaction is maintained. Hence the number of pounds of fish to be stocked could fluctuate up or down on a five year cycle dependant on survey results. During the first five year cycle, PG&E would be expected to stock 7200 pounds of trout annually. We note that PG&E is ultimately responsible for the management of all project reservoirs, including DeSabla forebay, and project reaches.

Additionally, we note, PG&E proposes to construct and operate a pipe to connect the terminus of Butte canal to the DeSabla intake to reduce thermal loading as a part of the water temperature improvement plan, see section 3.3.2.2, *Aquatic Resources*. Upon implementation of this plan, operating this pipe would likely result in a loss of consistent cool water inflow to the forebay causing warmer water temperatures within the forebay, compared to current conditions and may have the potential to negatively affect the current recreational trout fishery through loss of acceptable fish habitat. Anglers would be forced to access another recreational fishery such as Philbrook reservoir, another project reservoir, or Lake Oroville, located approximately 30 miles outside of the project. Moreover, the DeSabla Group Picnic Area is located across Skyway Road from the forebay. Loss of the DeSabla forebay recreational fishery may deter use at the picnic area as well.

**Informational Signs**

PG&E proposes to develop a project information and sign plan in consultation with the Forest Service within 1 year of license issuance. The plan would include the

types of informational signs to be developed, the design and content of each sign, and the locations on National Forest System lands where the signs will be placed.

Both Forest Service 4(e) condition 33 and BLM condition 18 specify PG&E develop and implement a sign and information plan conforming to the manual of Uniform Traffic Control Devices, the Forest Service and BLM's sign handbook, and other applicable standards in consultation with the Forest Service, BLM, California DOT, appropriate county agencies, and other interested parties. The plan should include, at minimum, the location, design, size, color, theme, and message for all interpretive, educational, informational, regulatory, warning, directional, and safety signs.

*Our Analysis*

Development and implementation of a sign plan and associated measures for the DeSabla project would provide the means for coordinated and systematic development of signage associated with the project. The sign plan would also provide the means to ensure that signage within the DeSabla-Centerville Hydroelectric Project is maintained and conforms to the Forest Service and BLM standards on lands that are visible from National Forest System and BLM lands. Review and approval of the plan by the Commission would ensure that the recommended component of the sign plan conform to Commission regulations for licensed hydropower projects.

**Streamflow Information**

PG&E proposed to make the daily average streamflow information available to the public via the Internet on the West Branch Feather River below Hendricks diversion dam and on Butte Creek below Butte Creek diversion dam and below Lower Centerville diversion dam no later than 1 year after license issuance.

Forest Service 4(e) condition 33 specifies streamflow and reservoir level information be provided via the Internet on project streams and reservoirs. Both FWS under 10(a) recommendation 17 and the Conservation Groups recommend the same.

*Our Analysis*

PG&E's proposed provision of providing streamflow information to the public would provide the means for the public to gain information regarding streamflow and reservoir levels for specified stream reaches and reservoirs. This information could then be used by the public to determine if recreation opportunities and desired flow ranges for angling, boating, and other recreation activities would be available. This would allow the public to take better advantage of opportunities for public recreation use at the project.

**Stream Access**

PG&E proposes to provide vehicle access to river reaches at selected project facilities and to file a plan, in consultation with American Whitewater and appropriate local landowners, in an attempt to obtain whitewater boating access to DeSabla powerhouse and to licensee's Miocene diversion dam impoundment, located outside of the project boundary, during the spring season. PG&E would file the plan for Commission approval within 1 year of license issuance.

FWS 10(a) recommendation 19 recommends PG&E provide recreational access to Butte Creek below the DeSabla powerhouse and Centerville powerhouse from December 1 to May 15 and the Conservation Groups recommend recreational access be provided from November 15 to May 15 each year upon license issuance. The Conservation Groups also recommend that PG&E convene an annual meeting of interested stakeholders to evaluate management issues arising from this provision of river access at these locations.

*Our Analysis*

American Whitewater, as a part of the Conservation Groups, met with PG&E in February 2007, to discuss the potential for recreational access at the DeSabla and Centerville powerhouses and releasing streamflow information on these two reaches in lieu of pursing mitigation measures that could result from phase 2 studies under the Recreation Flow Study. The Recreation Flow Study found both reaches to be popular boating opportunities; however, boaters were required to carry their boats down to the put-in sites at each reach, a 30-45 minute walk, resulting in poor access. American Whitewater states PG&E changed its position within the first months of 2008 and agreed only to give limited keyed access to members of the whitewater boating community and other "responsible" parties. Obtaining access would involve crossing private lands and PG&E has previously stated concerns with dumping trash and public safety in this area of the project. However, PG&E asserts it would make a good faith effort to facilitate discussions on access to the stream. This is a unique water-based recreation opportunity within the project. The provision of access during the winter and spring period at DeSabla and Centerville powerhouses would provide opportunities for increased whitewater boating at a time when whitewater boating opportunities within the region are not as abundant. PG&E's concerns with trashing dumping and public safety are valid. However, we note that there are several methods that may be employed to limit trash dumping and ensure public safety, such placing the gates further down the road and posting signage to prevent trash dumping and encourage pedestrian access. Consultation with American Whitewater, appropriate local landowners, and other appropriate stakeholders would also be a way to address PG&E's concerns and develop a plan to provide whitewater boating access at these locations.

### Recreation Monitoring

Both Forest Service 4(e) condition 33 and BLM condition 18 specify PG&E develop recreation use monitoring, reporting, and use triggers, in consultation with both agencies, in order to periodically monitor changes in recreation use patterns at the project. Monitoring would include conducting recreation user surveys, user counts and change in use patterns, and monitoring facility, ecological, and social capacity at all developed and dispersed project-affected recreation sites on National Forest System and BLM lands. PG&E would be required to conduct these monitoring efforts every 5 years, unless otherwise agreed to by the Forest Service and or BLM, and provide the results to all relicensing participants within 60 days, at minimum, prior to the annual consultation meeting. PG&E would be required to initiate an environmental analysis, to be completed within 1 year, when recreation monitoring indicates any of the following triggers during the primary recreation season: (1) 80 percent average occupancy during the weekends; (2) 65 percent average occupancy during weekdays; or (3) 100 percent occupancy on 50 percent of the holiday days.

Additionally, Forest Service specifies PG&E conduct an annual check on boating trends on Philbrook reservoir, with a mechanism to trigger a review at less than the 5 year monitoring interval if there are any sudden increases in boating use, accident rates, or user conflicts.

*Our Analysis*

Recreation use at the project is expected to double over the next 50 years. The level and type of recreation use and user preferences could change over the term of a new license. Periodic monitoring of recreation use, surveying user preferences, and assessment of facility capacity and recreation demand can help to determine if project recreation facilities meet demand and provide adequate public recreation access to the project over the term of the license. Monitoring boat use would help to identify excessive use and potential user conflicts on project reservoirs and this information would be used to examine existing use and develop mitigation measures if use is excessive or creating conflict among reservoir-based recreation users. Conducting an annual boat checks and including a boat monitoring protocol as a part of monitoring efforts every 5 years would project recreation facilities, including reservoirs, are meeting recreation demand over the term of the license.

### Law Enforcement

PG&E proposes to work with the Forest Service and County law enforcement officials to provide increased law enforcement at Philbrook reservoir recreation facilities during peak season. This includes consulting with officials on how best to inform them of services needed at the project and how to best deploy these services in the area.

Both the Forest Service and BLM specify PG&E provide a half-time project patrol position for patrol and maintenance activities on National Forest Service and BLM lands. Butte County recommends the same. Similarly, the Conservation Groups recommend PG&E provide financial support to cover the salary of one Butte county sheriff's deputy during the term of the license to address law enforcement and resource issues in the Butte and West Branch Feather River canyons. Both the Forest Service and Butte County state in their comments filed they do not require this person to be of law enforcement status in which FERC considers it to be the responsibility of the state and county.

*Our Analysis*

Project patrol measures would help encourage visitors, including anglers and boaters, to comply with regulations. A projected twofold increase in the number of visitors over the term of the new license would likely increase the need for public services, including law enforcement and fire protection, which are provided by the Butte County Sherriff's Office. More visible law enforcement or project patrol would help reduce conflicts between recreation users and improve visitor safety by providing an authoritative presence to encourage compliance with navigational laws. Additional project patrol at the more remote areas of the project would improve management of environmental resources by increasing visitor contact with enforcement agencies and help to educate visitors about appropriate and restricted uses.

However, within the project area, law enforcement duties fall to the Butte County Sheriff's office, the California Highway Patrol, and federal agencies on federal lands. The applicants pay property taxes to the counties within the project area, which are partially used to fund law enforcement. Further, the Commission has no way of ensuring that the hiring of personnel paid for by the licensee (in this case funding a seasonal employee), actually would accomplish a project purpose or ameliorate a project effect. However, the Commission can enforce specific measurable actions, such as operations and maintenance measures, such as maintenance of project lands and project recreation facilities to address litter and other associated potential effects of dispersed recreation use with the project boundary. Under PG&E's sign plan, the applicant proposes to post signs that provide public information about acceptable and prohibited recreation uses, and have proposed new measures that would increase public education to help improve visitor compliance with project rules and regulations. While improved implementation of Forest Service and County standards and guidelines regarding recreational use would be beneficial, enforcement of those regulations would be outside the jurisdiction and responsibility of the licensee.

## 3.3.6 Land Use and Aesthetic Resources

### 3.3.6.1 Affected Environment

#### Land Ownership

The DeSabla-Centerville Hydroelectric Project area is primarily made up of private lands owned by PG&E and Sierra Pacific Industries and federal, state, and county lands. Although Sierra Pacific Industries is the largest private landholder adjacent to the project, the Forest Service, BLM, Cal Fish & Game, and Butte County all have lands within or adjacent to the project.

The Plumas National Forest manages 0.4 mile of lands along Toadtown canal and 3.5 miles of lands along the West Branch Feather River. These lands are within the Forest Service's Flea Mountain Management Area and are managed for wildlife protection, fire prevention, recreation, and protection of river resources.

BLM administers lands primarily located in the lower portion of Butte Creek drainage and also a small parcel on the West Branch Feather River roughly 1 mile above the Miocene diversion. These lands fall within the Ishi Management Area of BLM's Redding Resource Area, which includes the Fort of Butte Creek Recreation Area, and they are managed for natural resource values and primitive to semi-primitive recreational opportunities.

Cal Fish & Game manages the Coon Hollow Wildlife Area and the Butte Creek Canyon and Butte Creek House ecological reserves, which are adjacent to Round Valley reservoir and the nearby project-affected reaches. These lands are managed to protect and enhance a wide variety of plant and animal species habitats and provides the public with wildlife-related recreation.

#### Areas Adjacent to the Project Boundary

Lassen Forest Service administers approximately 55 percent of land uses adjacent to Philbrook reservoir and all the lands adjacent to Round Valley reservoir. Forest Service has designated lands along Philbrook reservoir's northern end as Late Successional Prescription, and lands along the southern end near the dam as Riparian/Fish Prescription. Land uses around the northwest shore of Round Valley reservoir are in accordance with the Lassen Recreation Management Plan View/Timber Prescription. PG&E owns the remaining lands at the upstream of Philbrook reservoir and leases out land for 42 private summer homes just outside the project boundary at the north and south eastern shore.

PG&E owns all lands around the DeSabla forebay. These lands are zoned at Timber Mountain by Butte County and fall within the Paradise-Magalia Watershed

Protection Overlay Zone. Skyway Road runs along the forebay's eastern shore. A private recreation group camp, Jones Campground, is located on the forebay's western shore, as well as PG&E's regional hydro office, Camp 1, on the south shore.

Butte County manages private land uses in accordance with the Butte County General Plan and the county zoning ordinance. County land use zoning categories relevant to the project and project facilities are identified and defined in table 3-39.

Table 3-39. Land use category descriptions from Butte County General Plan and Zoning Ordinance. (Source: PG&E, 2007)

| Facility | Land Use Category | Purpose/Primary Uses |
|---|---|---|
| Toadtown powerhouse | Timber Preserve (TPZ) | Growing and harvesting timber |
| Centerville powerhouse | Foothill Recreational (FR) | Single family dwellings, resource extraction and processing exempt from permits and reclamations plans, protection of lands from various hazards, trails, agricultural experimental areas, utilities, day care homes, animal husbandry, food crops. |
| DeSabla powerhouse | Timber Mountain | Forest management, harvesting and processing of forest products |

Approximately two thirds of the lands along the project's 34 miles of canals are zoned for Timber Preserve or Timber Mountain (table 3-40). These lands are generally located in the upper project area along the Hendricks, Toadtown, and Butte canals. One third of lands adjacent to the canals are zoned as Agricultural or Foothill Recreational. These lands are located along the lower and upper Centerville canals in the lower portion of the project. BLM manages about 0.4 mile of lands adjacent to Toadtown canal. Butte County's watershed overlay zone also covers Toadtown canal and portions of Hendricks and Butte canals.

Table 3-40. Land use management distribution within and adjacent to canal project boundaries. (Source: PG&E, 2007)

| Land Use Management Designations | Miles of Canal | | | | |
|---|---|---|---|---|---|
| | Hendricks/ Toadtown | Butte | Lower Centerville | Upper Centerville | Total |
| Timber Preserve | 8.1 | 8.9 | 0.5 | | 17.5 |
| Timber Mountain | 1.7 | 0.8 | 2.1 | 0.3 | 4.9 |
| Commercial Forestry | | 0.1 | | | 0.1 |
| Agricultural-Residential | | | | 4.4 | 4.4 |
| Foothill Recreational | | | 5.2 | | 5.2 |
| Resource Conservation | | | | 0.2 | 0.2 |
| BLM | 0.1 | 0.4 | | | 0.5 |
| Plumas National Forest | 0.4 | | | | 0.4 |
| Unclassified | 0.2 | 0.5 | 0.1 | 0.2 | 1.0 |
| Total Miles | 10.6 | 10.7 | 7.9 | 5.1 | 34.2 |

**Roads**

Butte County has zoned lands along approximately 26 miles of project roads as Foothill Recreational, Timber Preserve or Timber Mountain, Unclassified, or Agricultural Residential (table 3-41). The remaining lands along project roads are managed by BLM and the Lassen National Forest.

Table 3-41. Land use management within and adjacent to the project boundary along project roads. (Source: PG&E, 2007)

| Land Use Management or Agencies | Miles of Project Roads |
|---|---|
| Timber Preserve | 15.1 |
| Timber Mountain | 4.5 |
| Agricultural-Residential | 0.1 |
| Foothill Recreational | 4.7 |
| BLM | 0.8 |
| Lassen National Forest | 0.1 |
| Unclassified | 0.9 |
| Total Miles | 26.2 |

### Project River Reaches

The project affects 55 miles of Butte Creek and the West Branch Feather River. About half of the lands along these rivers are zoned for Timber Reserve or Timber Mountain. About 11 miles of these lands are zoned for Foothill Recreational. BLM manages lands along 5.8 miles of the rivers, Lassen National Forest Service manages 3.6 miles, and Cal Fish & Game manages 1.5 miles.

### Aesthetic Resources

The visual aesthetic of the project area ranges from flat-topped buttes that border Butte Creek Canyon to the start of the Sierra Nevada mountain range. The project provides limited scenic vistas and attractions due to foothills and mountainous terrain dominated by steep canyons and ravines as well as densely forested areas that obscure any expansive views. Round Valley and Philbrook reservoirs are located at higher elevations and provide opportunities to view limited scenic vistas of the valley that they lie within. Unique vistas in the project region are found along Butte Creek where the river has created steep, narrow canyons with large pools and drops.

Round Valley is at the upper end of the project in a hilly volcanic terrain, surrounded by a Sierran mixed conifer forest. Lands around the reservoir are managed by Lassen National Forest as partial retention and modified visual quality objectives. Within partial retention areas, management activities should be visually subordinate to the natural surrounding character while management activities are dominant within modified visual quality objective areas, but should conform to the surrounding natural character.

Philbrook reservoir, located near the head of Philbrook Creek, is roughly 15 miles southwest of Round Valley reservoir and surrounded by dense forests of ponderosa pine, incense cedar, white fir, Douglas fir, and sugar pine. Forest Service lands around Philbrook reservoir are managed in accordance with retention, partial retention, and modified visual quality objectives. Unlike partial retention areas, management activities should not be visually evident within retention areas.

DeSabla forebay is located on relatively flat terrain above Butte Creek on Paradise Ridge, which is a major geographical feature in Butte County. Although the forebay is surrounded by a ponderosa pine forest, DeSabla forebay dam is a dominant visual feature that forms the southern shore.

Due to the rugged topography and dense forest cover, Hendricks and Toadtown canals are visible only for a hundred feet or less on each side where they cross Skyway road. Butte and Centerville canals cut a horizontal band along the eastern side of the Butte Creek Canyon. The canals and powerhouses located at the bottom of the canyon are dominant elements in the landscape. However, due to the limited accessibility of the

canyon, the public are less likely able to view these facilities. The facilities can only be seen by visitors who use the canals for hiking. For the same reason, Toadtown, DeSabla, and Centerville powerhouses have low to moderate visibility from public areas. There is no public access in these areas.

**Project River Reaches**

The West Branch Feather River flows 20 miles from Round Valley reservoir to Miocene diversion through steep wall canyons and dense forest. Views into the canyons are limited; however, there are some public roads that provide access to views of river. Forest Service lands surrounding the river are managed in accordance with retention, partial retention, and modified visual quality objectives.

A 2-mile-long section of Philbrook Creek below Philbrook dam flows through a steep, forest-covered valley before opening its confluence with the West Branch Feather River.

Butte Creek extends from Butte Creek diversion dam a length of 26 miles to Parrott-Phelan diversion dam, through a deep, narrow incised canyon that is inaccessible for much of its length. This canyon sustains a dense vegetation cover ranging from riparian vegetation at the bottom of the canyon to foothill woodleaf along the canyon walls. The steep sloped canyon has limited developments and is typically reached via unimproved roads. Butte Creek diminishes downstream of Centerville powerhouse and is the most heavily settled portion of the watershed. The area is distinctive for canyon views from bottom and rim of the canyon.

### 3.3.6.2 Environmental Effects

**Transportation System Management Plan**

PG&E proposes to develop and implement a transportation system management plan, in consultation with the Forest Service, for the protection and maintenance of roads associated with the project on National Forest System lands within 1 year of license issuance. This plan would include, at minimum, a map showing all roads associated with the project with respect to the project boundary and maintenance responsibilities, identification of uses on each road, condition surveys, construction/reconstruction needs, road closures, safety, and jurisdiction (e.g. county, state) of each road. The plan would also include measures, such as installing gates, to rehabilitate existing erosion damage and minimize future erosion on project access roads on National Forest System lands and measures for temporary traffic control and public safety when project construction is in progress, as according to the "Manual on Uniform Traffic Control Devices for Streets and Highways." Both FWS recommendation 18 and NMFS recommendation 3 under 10(a) are consistent with PG&E's proposed transportation system management plan for

protection and maintenance of roads associated with the project on BLM and other appropriate county, state, and federal lands.

Forest Service condition 36 specifies that PG&E file a transportation system management plan, approved by the Forest Service, for the protection and maintenance of roads associated with this license that are on or affecting National Forest System lands within 1 year of license issuance. The purpose of the plan is to rehabilitate existing damage and minimize erosion from project use of roads on or affecting National Forest System lands in order to meet appropriate Forest Service Maintenance and Traffic Service Levels 1. The plan would include, at minimum, a cooperative road agreement to define road share costs and responsibilities, resource protection and erosion control measures, and a map and inventory of roads necessary for the project that are on or affecting National Forest System lands. Additionally, PG&E would be required to develop and implement a monitoring plan to determine project-associated use and trends pertaining to traffic, road maintenance conditions, and air quality conditions over a 5 year period after license issuance. This data would be used to assist in the development of proportionate road share costs. Upon implementation, PG&E would need to obtain an encroachment permit and/or meet any other applicable requirements when operating on National Forest System lands.

*Our Analysis*

The transportation system management plan would help to clarify PG&E use of Forest Service roads and establish a forum for coordination of road maintenance activities between PG&E and the Forest Service. The plan delineates PG&E's responsibilities for monitoring project roads used for project operations and maintenance and ensures that safety and environmental measures associated with these roads are addressed in the proper manner. Some of the Forest Service and other public roads the applicant uses to access project facilities for operation and maintenance purposes are also used by the Forest Service for administrative and land management purposes, and the public for recreational activities. The development of a transportation management plan, in consultation with the Forest Service, would enable ongoing maintenance and associated planning responsibilities to be clearly defined. We recommend that PG&E consult with Butte County and the state and regional Water Boards, in addition to the Forest Service, on the transportation system management plan. We note that any access road used primarily for project purposes requiring routine maintenance would need to be included within the project boundary. However, roads located outside the project boundary are not subject to Commission jurisdiction or the terms and conditions of the license, therefore, they would be outside the scope of 4(e) conditions.

The Forest Service specifies the traffic monitoring plan would help to determine project-associated use on roads within the project area as well as assist in the development of road share costs. Through the NEPA process, project and non-project

roads have been clearly defined and as noted above, the licensee is responsible for the maintenance of all project roads within the project boundary. Gathering additional information to determine project-associated use or cost sharing responsibilities on roads located outside the project boundary would not provide any information needed to manage project roads.

**Road Maintenance**

In addition to the transportation system management plan, Forest Service condition 36 specifies that PG&E develop a design for reconstruction of the North Fork Feather River road crossing below Round Valley reservoir, reconstruct any existing roads listed in table 3-42 not currently meeting Forest Service standards, and implement temporary traffic controls to provide the public with adequate warning and protection from hazardous or potentially hazardous conditions during project construction. PG&E would be responsible for the operation and maintenance of project-affected roads on or affecting National Forest System lands, including snow plowing and removal when needed, outsloping, treating potential erosion, upgrade surfacing, etc.

Table 3-42. DeSabla-Centerville Hydroelectric Project-associated roads on or affecting Forest Service lands. (Source: Forest Service, 2008)

| Road Name | On Forest Service Lands | In Project Boundary | Start | End |
|---|---|---|---|---|
| Round Valley Dam | Yes | Yes | Summit Road | Round Valley Dam |
| Gage BW45 | Yes | No | Summit Road | Gage BW45 |
| Philbrook Dam Road | Yes | Yes | Philbrook Road | Philbrook Dam |
| Philbrook Boat Launch Access Road | Yes | Yes | Philbrook Road | Philbrook Dam |
| Philbrook Campground Loop | Yes | Yes | Philbrook Road | Philbrook Road |
| Philbrook Cabin Driveways | No, but affecting Forest Service lands | No | Philbrook Road | Philbrook Road |
| Humbug Summit Road | Partially, and affecting | Partially | Skyway Road | Philbrook Road |
| Philbrook Road | Partially, and affecting | No | Humbug Road | Last lessee cabin driveway |

BLM condition 20 specifies PG&E annually repair and maintain that portion of Ditch Creek Road from the BLM's entrance gate to the point where the project's 9/1 spillway crosses Ditch Creek Road. PG&E would also maintain the road to BLM standards. Further, PG&E would install and maintain a new entrance gate at BLM's entry point to Ditch Creek Road, when determined necessary by BLM.

To improve road conditions and safety hazards caused by gravel, Butte County recommends PG&E update the guardrails to the current Caltrans standards and specifications for guardrails on county-maintained roads where project canals or flumes cross as well as pave back the apron to the county right-of-way at the project powerhouse road off Humbug Road, just south of the DeSabla forebay. Furthermore, Butte County recommends PG&E pave the unimproved road sections on Skyway, Centerville, Nimshew, Doe Mill, Powellton, and Retson Roads to meet California Air Resources Board's requirement to reduce toxic air pollution from naturally occurring asbestos, as well as to meet the state's standards for other particular matter and sediment and soil erosion. At minimum, Butte County recommends PG&E pay the county an annual fee for the operation and maintenance of said roads and/or be responsible for the operation and maintenance of these roads according to National Forest Service standards.

Finally, in its comments filed February 27, 2009, the Forest Service recommends that the West Branch Feather River road crossing (identified as BW45 road in table 3-42) be designated as a project road by the Commission and that it be included in the project boundary if a new license is issued.

*Our Analysis*

Implementing temporary traffic controls would ensure adequate access and public safety are provided during the construction of the project. We recommend the implementation of temporary traffic controls on all lands within the project boundary. As noted above, PG&E is responsible for any access road within the project boundary requiring routine maintenance and would also be responsible for the safety of the public on these roads. We agree that, because the licensee uses the West Branch Feather River road crossing (Gage BW45) to access its gage below Round Valley reservoir when spill flow prevents access across the dam, it would be appropriate to designate this road as a project road and include it within the project boundary. However, several of the roads listed in table 3-42 for reconstruction fall outside of the project boundary. Furthermore, Skyway, Centerville, Nimshew, Doe Mill, Powellton, and Retson roads also are all outside of the project boundary. Roads located outside the project boundary are not subject to Commission jurisdiction or the terms and conditions of the license; therefore, they would be outside the scope of 4(e) conditions and not the applicant's responsibility.

### Fire Management

Forest Service condition 34 specifies PG&E develop and implement a fire management and response plan in consultation with the Forest Service. This plan would include, at a minimum, identification of potential fire hazards and measures to reduce fire hazards at the project, prevention and public safety measures, emergency response preparedness measures, and a list of locations of available fire suppression equipment and personnel. PG&E would be required to cooperate with the Forest Service on all fire investigations.

*Our Analysis*

Recreation at the reservoirs and stream reaches, including at project facilities and user-created dispersed sites, pose a potential fire risk and that risk will increase as recreation use increase in the future. Given the known high incidence of fire status and previously treated and untreated fuels in the area, PG&E should take reasonable preventative and pre-suppression actions at its project facilities to help prevent wildfires and create safer conditions for the visitors brought to the area by the project facilities and reservoirs. Implementation of the proposed fire management and response plan would improve planning, management and coordination of wildfire protection and prevention measures, as well as lead to a reduction in the occurrence and suppression of wildfires that might be project-induced.

### Aesthetics

PG&E proposes to consult with the Forest Service prior to painting, reconstructing project facilities, or revegetating areas on National Forest System lands and to use natural materials to blend with the environment. PG&E also proposed to maintain all its improvements at the project, including disposal piles and dispersed recreation areas within the project boundary, to Forest Service standards. Disposal would be at an approved existing location, except as otherwise agreed to by the Forest Service, and any problem areas would be discussed at the annual consultation meeting.

Forest Service condition 34 specifies PG&E develop and implement several visual management action items, in consultation with the Forest Service that includes painting, revegetating, screening, and repairing facilities so they blend into the natural environment. This also includes removing, burning, or disposing of debris piles on National Forest System lands prior to the primary recreation season and stabilizing and/or revegetating eroding channel banks to minimize erosion and allow for the restoration of a naturally appearing stream course. For those facilities that cannot be made less visible, the Forest Service specifies PG&E develop interpretive facilities and evaluate all project-associated signs for visual appeal. PG&E would be required to develop an implementation schedule for Forest Service and Commission approval.

BLM condition 3 also specifies PG&E maintain all its improvements and premises on BLM lands to standards of repair, orderliness, neatness, sanitation, and safety acceptable to BLM. Disposal would be at an approved existing location, except as otherwise agreed by BLM.

Additionally, we note that PG&E proposes to construct and operate a pipe to connect the terminus of Butte canal to the DeSabla intake to reduce thermal loading as a part of the water temperature improvement plan, see section 3.3.2.2 *Aquatic Resources*. Upon implementation of this plan, because inflow to the forebay would be limited to the local watershed after this pipe becomes operational, it has the potential to cause stagnation to the forebay may become stagnated or even dry up, thus negatively affecting the visual aesthetics of this area at the project.

*Our Analysis*

PG&E's implementation of a visual resource plan, specifically the selection of neutral paint color schemes that blend in with surrounding landscapes, would reduce visual effects on the aesthetic resources at the project. Stabilizing and revegetating eroding channel banks to minimize erosion would also help to restore the natural habitat surrounding the streams. Developing interpretive facilities would also help to mitigate for project facilities impairing scenic views at the project and in turn, would educate the public about the project.

## 3.3.6 Cultural Resources

### 3.3.6.1 Affected Environment

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register. Historic properties are defined in section 106 as cultural resources listed or eligible for listing in the National Register. Historic properties represent things, structures, places, or archeological sites that can be either Native American or European-American in origin. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register.

**Area of Potential Effects**

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by a proposed new license within the project's APE. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE for the DeSabla-Centerville Hydroelectric Project includes all the lands within the project boundary and lands outside the project boundary that may be affected by project operations, maintenance, and recreation activities. This

expanded APE includes public lands between Philbrook reservoir and adjacent roads, and public lands along the West Branch of the Feather River between Round Valley reservoir and Philbrook creek. Additionally, several project-related access roads not contained within the project boundary also were added to the APE.

As noted by PG&E, not all lands within the APE were accessible during the survey due either to steep terrain, lack of landowner permission in private residential areas, or other unsafe conditions (e.g. entering project tunnels). Areas not surveyed are listed in table 3-43.

Table 3-43. Portions of the APE excluded from Archaeological Survey. (Source: PG&E, 2007a)

| Locations Not Surveyed | Reason Not Surveyed |
|---|---|
| Two unsurveyed areas (approximately 1.75 miles) along West Branch Feather River and Philbrook Creek | Too steep |
| Two unsurveyed areas along West Branch Feather River (approximately 0.25 mile) and Philbrook Creek (approximately 0.75 mile) | Too steep |
| Interior of Philbrook reservoir | Most of reservoir inundated |
| Approximate 11.5 acre-area on south side of Philbrook reservoir | Too steep and too much natural tree fall |
| Hendricks Tunnel | Unsafe |
| Hendricks and Lovelock tunnels | Unsafe |
| All portions of the APE on this map are along the West Branch Feather River and were not surveyed, approximately 3.5 miles | Too steep |
| Approximately 4.0 miles of the Butte Creek Canal | Too steep |
| Approximately 2.0 miles of Butte Creek Canal | Too steep |
| Lovelock Tunnel, Toadtown penstock, Rapid pipe | Unsafe |
| Approximately 1.5 acres on LNF | Dense vegetation |
| DeSabla forebay | Inundated |
| Approximately 1.5 acres on LNF | Dense vegetation |

| Locations Not Surveyed | Reason Not Surveyed |
|---|---|
| DeSabla forebay | Inundated |
| Approximately 2.5 miles of the Lower Centerville Canal | Too steep |
| 0.75 mile of Emma Road and a section of the Lower Centerville Canal, between Emma Road and Chimney Rock Tunnel | Restricted landowner access |
| 1.0 mile of Upper Centerville Canal | Dense brush, no private landowners access permission |
| 3.75 mile of Lower Centerville Canal | Too steep |

In addition, surveys at Round Valley reservoir were delayed until the reservoir was empty and the underlying sediments were dry. Once accessible, all lands within the reservoir were accessible and examined during the survey. At Philbrook reservoir, the existing FERC license requires PG&E to maintain a minimum pool of water, which precludes emptying the reservoir and eliminates the opportunity to survey within or below the minimum pool level. As a result, only the exposed upper portions of the reservoir and the adjacent lands outside the reservoir were examined.

**Consultation**

Five federally recognized Tribes with an ancestral connection to the project area were identified and contacted by both the Commission and PG&E. On July 9, 2004, the Commission sent letters to the Berry Creek Rancheria of Maidu Indians, the Enterprise Rancheria of Maidu Indians, the Greenville Rancheria of Maidu Indians, the Mooretown Rancheria of Maidu Indians, and the Mechoopda Indians of the Chico Rancheria. The Commission received acknowledgement of interest from both the Greenville Rancheria and the Mechoopda Indian Tribe and hosted an initial consultation meeting on September 23, 2004.

PG&E and the Commission proceeded to consult on a regular basis with the Lassen and Plumas National Forests, BLM, the Mechoopda Tribe, the Greenville Rancheria, the California SHPO, and other relicensing participants regarding cultural resources issues. This consultation has taken the form of written document submittals, meetings, site visits, phone calls, workshops, and a formal memorandum of understanding between PG&E and the Mechoopda Indian Tribe to undertake the Traditional Cultural Properties study. The memorandum of understanding PG&E executed with the Mechoopda Tribe was designed to protect the confidentiality and

ultimate control of new ethnographic information obtained from the Tribe, who also provided assistance in the identification of potential respondents. Consultation with Greenville Rancheria has been more informal, consisting of two meetings and a verbal agreement.

All comments and concerns received during these consultations have been addressed by PG&E and the Commission. To date, few comments have been received by the California SHPO; however, on June 16, 2005, PG&E received comments from the SHPO on the project's APE. The SHPO requested that the APE include the entire West Branch of the Feather River and stated that the APE should be applied consistently, regardless of land ownership. In response, PG&E expanded the APE to include the West Branch Feather River down to and including Philbrook Creek. PG&E also made a good faith effort to access all land within the APE, including private lands, but not all landowners allowed access. The Commission approved the APE on August 18, 2005, with the understanding that if it should be demonstrated that project activities may be affecting area outside the current project APE, the APE would be expanded to include these areas. In addition to consultation on the APE, PG&E also has requested SHPO concurrence on various other section 106 requirements, including National Register evaluations of specific resources.

**Native American Monitoring**

In response to PG&E's invitation, the Greenville Rancheria and the Mechoopda Tribe provided qualified monitors during the archaeological field work conducted for the relicensing. Prior to performing the field work, PG&E developed a tribal monitoring protocol specific to the project and the Greenville Rancheria and the Mechoopda Tribe reviewed the protocol, which was finalized on September 15, 2005. In accordance with the monitoring protocol, tribal monitors were responsible for assisting the archaeological field supervisor in identifying potentially sensitive areas, reporting daily monitoring results to the Tribes, ensuring that the appropriate parties were contacted if human remains were encountered, and completing daily field logs. The Tribes oversaw tribal monitoring efforts, coordinated field work schedules, and ensured that a monitor was present during each field session. The field crew was assisted by one monitor at a time, with monitors from each Tribe rotating sessions. PG&E included copies of the monitoring reports in final license application and HPMP.

**Cultural History Overview**

*Prehistoric Archaeological Overview*

Geographically, the project is located near the juncture of the northern Sierra Nevada and the southern Cascade Range. Until recently, archaeological investigations within the project area were limited and the area's prehistory poorly understood, relying heavily on the temporal-cultural sequences developed in neighboring locations.

Information is relatively scarce, most likely due to limited human occupation. Recent studies, however, have provided more specific details about prehistoric human occupation in the project area.

Research indicates that human occupation in the project area dates to slightly before 10,000 BC and most of the sites identified in the project vicinity have been characterized by traits defined within the Eastern Sierra Front sequence for the northern Sierra Nevada. Development of the prehistoric chronology for the Eastern Sierra Front began more than 50 years ago and currently identifies seven phases of occupation that extended throughout the Holocene, demonstrating the longest cultural sequence identified for the Sierra Nevada. Table 3-44 identifies the cultural sequences associated with the Eastern Sierra Front.

Table 3-44. Prehistoric chronology of the Eastern Sierra Front. (Source: PG&E, 2007a)

| Adaptive Strategy | Phase | Age (Years B.P.) | Diagnostic Artifacts |
|---|---|---|---|
| Late Archaic | Late Kings Beach | 150-700 | Desert Series Points |
| | Early Kings Beach | 700-1,300 | Rosegate and Gunther Series points, seed hullers, M1a (*Olivella*) shell beads |
| Middle Archaic | Late Martis | 1,300-3,000 | Martis Corner-notched, Elko Corner-notched, and Elko Eared points |
| | Early Martis | 3,000-5,000 | Martis Contracting Stem and Steamboat points |
| Early Archaic | Spooner | 5,000-8,000 | Unknown |
| Pre-Archaic | Tahoe Reach | 10,000-8,000 | Great Basin Stemmed Series points |
| | Washoe Lake | >10,000 | Fluted points |

The earliest phase of this sequence, the Washoe Lake Phase, is characterized only by large, fluted projectile points that suggest a small, highly mobile population. The Tahoe Reach Phase provides a regional comparison with the Western Stemmed Complex of the Great Basin and is defined by large, stemmed, edge-ground, isolated, basalt

projectile points. These artifacts may indicate a highly mobile people or an initial occupation of the area following Sierran glacial retreats. The Spooner Phase represents an interval of prehistory that is poorly understood because it lacks clear, distinct, diagnostic evidence. This does not mean occupation did not occur at this time but could be due either to a paucity of time-sensitive remains or to low human population.

The Martis Complex is divided two phases, the Early Martis (5000-3000 BP) and Late Martis (3000-1300 BP). These phases correspond to the Middle Archaic adaptive strategy of the Great Basin when the archaeological record demonstrates a dramatic increase in human activity. Early Martis sites are defined by Martis Split Stem, Martis Contracting Stem, and Steamboat Leaf Shaped projectile points manufactured primarily of basalt. Late Martis sites are characterized by Martis and Elko Corner-notched and Elko Eared projectile points.

Paleo-environmental evidence indicates the Lake Tahoe area suffered severe droughts around 1000-900 years ago and 600-500 years ago, which appear to have given rise to the Late Archaic adaptive strategies evident in the Kings Beach Phases. The Early Kings Beach Phase represents the beginning of this era, as evinced by the use of the bow and arrow, increased used of chert tool-stone, smaller tools, shallow bedrock mortars, possible reduction in house size, and the introduction of flat, stone hullers for cracking nuts. Projectile point styles are represented by the Rosegate and Gunther series and during this time winter base camps being to appear in previously unoccupied locations or in areas previously reserved as field camps. The Early Kings Beach Phase appears to provide evidence of the early Washoe. The final stage prior to human contact, the Late Kings Beach Phase, is defined by temporary or seasonal camps ascribed to the late prehistoric Washoe. These camps provide evidence of hunting and fishing by small groups and are defined by Desert Series projectile points, chert cores, small, flaked chert tools, and some milling stones.

Previous research suggests that comparisons between the neighboring Great Basin and Tahoe Reach projectile point styles demonstrate the long-term influence of Great Basin culture on the Tahoe Basin and that, with the exception of the Late Kings Beach Phase, the cultural sequence of the Sierran Front reflects adaptations to the eastern front and high country throughout the early and middle Holocene. Human adaptive strategies during these times were strongly connected to, as well as influenced by, paleo-environmental conditions.

*Ethnographic History*

The project area is the ancestral home of the Northern Maidu. The Maidu family of languages can be distinguished into at least three different groups that include the Northwest (Koncow and Mechoopda), Northeastern (Mountain or Greenville), and Southern (Nisenan). The mountain Maidu occupied the high mountain meadows from

Lassen Peak east to Susanville, south to Quincy, and west to Bucks Lake and the Humbug Valley. Koncow and Mechoopda territory encompassed portions of the Feather River, Butte and Chico creek watersheds, and part of the Northern Sacramento Valley, including all or most of the DeSabla-Centerville Hydroelectric Project area.

The Maidu lived in village communities that formed the basis of their geography and political organization prior to Euro-American contact. The Maidu occupied their villages through the winter months and camped throughout the foothills and mountain areas during seasonal hunting and gathering cycles. The project lies within the ethnographic territories used as both semi-permanent wintertime villages and summertime hunting territories, which would have contained seasonal and temporary camps.

Annual cycles of gathering, hunting, and fishing were maintained to procure a wide variety of resources for subsistence and material needs. Plant gathering was one of the most important aspects of Maidu subsistence and was usually done by women. Fishing and hunting were largely conducted by men and the communities relied on the taking of elk and deer during the winter months. These activities necessitated the need for bows and arrows, knives, spears, and hooks, and nets and snares.

Basketry was a critical component of gathering, processing, and sorting subsistence materials and baskets were made from a variety of plants, predominantly willow, redbud, bear grasses, common brake, maidenhair fern, hazel shoots, and the ponderosa pine. The Maidu recognized hundreds of species of plants that were used for subsistence, material, and medicinal purposes and most parts of the plant were utilized in some fashion.

Contact between Maidu and Euro-Americans began in the early 1800s when Spanish explorers entered Maidu territory. An epidemic of malaria (smallpox) in 1833 decimated Maidu populations and the 1948 gold rush further displaced and diminished the Tribes. These pressures altered traditional Maidu political and cultural organization and made traditional subsistence difficult or impossible.

The project APE and vicinity is very well known to present-day Maidu residents. Maidu decedents maintained residence in the vicinity of project well into the middle of the twentieth century and present-day Maidu communities are interested in maintaining (or reestablishing) access to important traditional resources within the project vicinity. The project vicinity has been used on an occasional basis in the recent past for traditional and modern fishing along Butte Creek (downstream end of the APE). Present-day Maidu also maintain that the project vicinity contains an abundance of traditionally important plant resources.

The project vicinity is not well represented in the extant ethnographic literature. The dearth of ethnographic data does not reflect lack of ethnographic period use; rather, it

speaks to the effects of rapid Euro-American settlement and disruption of traditional cultures and geographic distribution in the general region. While many people possess regional and geographically specific knowledge about the project APE and vicinity, however, no knowledge currently exists regarding specific sites of ongoing traditional uses (Traditional Cultural Properties).

**Historic Context**

Euro-American pioneers first began to settle in the project vicinity in the 1840s. Influences of the Euro-American lifestyle and technological ventures forever altered the project landscape as ranching, mining, lumber, transportation, turpentine production, hydroelectric power, turpentine production, organized forestry, and recreation were introduced. Such interests continued for extensive periods of time, with some still actively pursued today. Most of these pursuits depend on the waters of Butte Creek, the West Branch Feather River, and their various tributaries

Although trappers from the Hudson's Bay Company were hunting along the rivers of Butte County by 1829, ranching appears to be the first Euro-American activity to occur with any consistency within the project area. Before miners began flooding into California in the late 1840s, settlers trickled into the state earlier in the decade and ranching became the state's dominant industry. Available archival sources do not indicate any Euro-American settlement in the project area prior to 1848; however, with the discovery of gold in 1848, mining quickly became the primary force driving immigration to California.

With technological advances, the process of mining for gold became more and more efficient. Harnessing the power of water to blast away the sediments obscuring the elusive gold, a process known as hydraulic mining, became increasing popular and destructive. By the 1880s, the river courses throughout the project vicinity and beyond were choked by the gravel and other by-products of hydraulic mining and gold was becoming scarce. Small operations continued through the 1890s; however, the 1893 Caminetti Act, which prohibited the disposal of mining tailings into river courses, eventually brought an end to hydraulic mining and the golden age of gold mines.

The gold rush and the resulting increase in California's population influenced all aspects of the region's economy, from ranching, to lumber, recreation, transportation, and hydroelectric development. As population grew, the demand for beef sent the price of cattle soaring. Also, in the project area, the development of roads not only improved access to the gold mines but facilitated the stockmen's annual trek up and down the Butte County highlands and increased access for the lumber industry. The California lumber industry arose as a direct result of the demands created by the gold rush for building materials. The stream engine also was associated with the growth of the lumber industry in the project area. In the early days of the gold rush, timber was hauled via teams of

oxen and cut manually by whipsaw, but in 1863, the first steam-powered mill in the area was set up. Steam-driven saws greatly increased the output of board produced by the mills, and in time the new engines were applied in almost every operational aspect of the lumber industry.

The massive depletion of timber resources in the west during the late nineteenth century motivated Congress to pass legislation to reduce timber exploitation. In response, Congress approved the Forest Reserve Act (section 24 of the General Revisions Act) which gave the U.S. President the power to establish forest reserves. Named for Mount Lassen, the Lassen Peak Forest Reserve was proclaimed in 1905 and renamed in 1908 as the Lassen National Forest. While maintaining forest reserves was the main mission of the Lassen National Forest, the National Forest System also was responsible for overseeing water resources. As such, hydroelectric development specific to Lassen National Forest began in the latter part of the 1800s. With the end of large-scale hydraulic mining, the National Forest and other hydroelectric developers began acquiring abandoned mining ditches and flumes for future hydroelectric developments such as the DeSabla-Centerville hydroelectric project.

John Martin and Eugene DeSabla formed PG&E in 1905 and by 1915 it became one of the five largest utilities in the country and largest single producer of hydroelectric power. In 1902, PG&E decided to build a new hydroelectric system at the current DeSabla site and also purchased the existing Centerville powerhouse system (built in 1899) which included the dams, pipeline, and ditches of the local abandoned mines. PG&E then constructed a reservoir, penstocks, and powerhouse, and used the water carried by the old ditches to generate power in the new DeSabla hydroelectric system. At the same time, PG&E built the road to the DeSabla power plant site, enlarged the canals, rebuilt flumes, and refurbished the Centerville powerhouse.

Once the basic elements of the DeSabla-Centerville system—reservoirs, powerhouses, ditches, and transmission lines—were in working order, PG&E sought to enlarge its capacity and standardize the system. This included lining of canals to increase efficiency of water transport, replacing old canals and flumes with new materials, and constructing Philbrook storage reservoir in 1926. While some automated equipment was put in place to upgrade the system from time to time, prior to 1960, most of the DeSabla-Centerville hydroelectric system remained manually operated. Powerhouses required operators onsite 24-hours a day and the canals required constant patrolling. Due to this constant surveillance, the project also included numerous construction and tenders' camps to house employees.

In the 1960s, PG&E began overhauling the system for the sake of efficiency. The original DeSabla was demolished and rebuilt in 1961, new penstocks were constructed, and the DeSabla forebay was refurbished. At this time, the DeSabla and Centerville

powerhouses became semi-automated and other automated controls were put into place so 24-hour surveillance was no longer required.

**Site Identification and National Register Evaluation**

At least 39 previous cultural resource investigations have occurred within or adjacent to the project's APE since the early 1970's. Thirty-four of these surveys were completed for timber harvest sales, land transfers, and project-specific ground-disturbing activities. During these investigations, 16 cultural resource sites were identified and documented within the APE. A search of the National Register identified five historic properties within the project vicinity, but no properties listed on the National Register are located within the APE.

During the project's relicensing field surveys for archaeological and historic-era properties, the majority of lands that could be surveyed were examined by a qualified archaeologist using an intensive strategy (15-meter transects). Portions of the project containing moderately steep slopes or moderate to dense vegetation were examined using a moderate strategy (20-40-meter-wide transects), and other locations of dense brush were surveyed in a cursory fashion using opportunistic transects. All topographical features encountered in moderate areas and considered to be sensitive for cultural resources (i.e., springs, drainages) were thoroughly inspected. Newly discovered cultural remains were assigned temporary field numbers using a "DC" (DeSabla-Centerville) designation followed by a number (e.g., DC 1, DC 2). Numbers were assigned sequentially as cultural materials were encountered. All items encountered were assigned a number.

During the relicensing field surveys for the DeSabla-Centerville Hydroelectric Project, 46 archaeological and historic-era sites and four isolated finds were recorded (see table 3-44). PG&E located and re-recorded the 14 previously documented sites and identified 32 new archaeological and historic-era sites within the APE. Of the 46 sites encountered, four are strictly associated with prehistoric occupation, eight contain both prehistoric and historic-era cultural remains, and 34 represent historic-era activities that characterize several themes in the prehistory and history of the American west.

Thirty-four of the 46 sites contained only historic-era cultural remains and PG&E conducted formal evaluations of these sites for National Register-eligibility. Five are evaluated as being eligible to the National Register (CA-BUT-871-H, CA-BUT-873-H, DC-22-H, DC-46-H., and DC-51/H), and two sites (BCC-5, DC-22) require further study before an evaluation can be made. The remaining 27 sites are evaluated as ineligible for listing on the National Register. PG&E sent a letter to the SHPO on January 9, 2008, requesting concurrence on the National Register evaluations and has not yet received a response.

The remaining 12 sites contain prehistoric materials. Of these 12 sites, four contain strictly prehistoric remains while eight contain both prehistoric and historic components. Whenever possible, National Register eligibility assessments of prehistoric sites or sites containing prehistoric components were undertaken without ground-disturbing activities. When non-intrusive evaluation was not possible or where test excavation was opposed by participating Tribes, unevaluated sites were presumed eligible and PG&E made an informal determination of eligibility. Until formal evaluation is undertaken, PG&E states that all 12 of these sites are considered potentially eligible for listing on the National Register. Informal evaluation; however, indicates that three of the sites that contain both prehistoric and historic-era elements may be ineligible for listing (DC-9, DC-15, and DC-44), and a fourth prehistoric and historic-era site (DC-51/H) is evaluated as being eligible as a contributing element to the hydroelectric system, as well as potentially eligible as an individual property.

During study plan development, PG&E and the Forest Service identified ongoing project-related effects at four previously identified archaeological sites containing both prehistoric and historic-era cultural remains and features. In order to address the ongoing project effects as soon as possible, PG&E began working with the Commission's Division of Hydropower Administration and Compliance under the current license to survey and identify mitigation measures at these sites. While delayed several times due to reservoir inundations, the surveys were finally completed and the four sites were found to be one continuous scatter of cultural remains and were re-recorded as a single resource (CA-BUT-1225/H).

Table 3-45 includes a list of all identified sites found within the project APE, their general location, a description of each site, and the result of PG&E's assessment on National Register eligibility.

Table 3-45. Prehistoric and historic-era sites within the APE. (Source: PG&E, 2007a)

| Site No. CA-BUT-XXXX | Location[a] | Land Owner[b] | Description[c] | Impacts | National Register[d] |
|---|---|---|---|---|---|
| 597/H | Toadtown | Private/ SPI | Lithic Scatter, Brm, Historic Bottle Frags | Logging Roads, Slash, Public Access | Potentially Eligible |
| 868-H | Desabla | PG&E | Original Desabla Powerhouse Site: Foundations, Pads, Trash Deposits | Current Powerhouse Built On The Same Site | Ineligible |
| 871-H | Butte Creek Canal | PG&E | Camp 2 Butte Creek Canal: Foundations | Structures Removed, Erosion | Eligible As Contributing Property |
| 872-H | Toadtown | Private | Poumeratt Quartz Mine: Foundation, Drift, Structures | Vandalism, Erosion | Ineligible |
| 873-H | Lower Centerville Canal | PG&E | Hog Ranch Ditch Tender's Camp: Foundations, Pads, Trash Deposit | Trash Dump, Erosion | Eligible As Contributing Property |
| 877-H | Toadtown | Private, Possible BLM | Mining Ditch | Vegetation, Disturbance From Roads And Tailings Covering Ditch | Ineligible |
| 887-H | Desabla | PG&E | Orofino Mine Entrance | Culvert Construction, Road/Creek Alterations | Ineligible |
| 965-H | Desabla | Private | Indian Spring Mine | Disintegration, Looting, Modern Prospecting | Ineligible |

| Site No. CA-BUT-XXXX | Location[a] | Land Owner[b] | Description[c] | Impacts | National Register[d] |
|---|---|---|---|---|---|
| 1111-H | Toadtown | Private | Corral With Refuse Scatter | Logging, Vehicle Access | Ineligible |
| 1225/1226/ 1227/1228/H | Rvr | LNF | Ls, Qry, Hts, Hr | Fluctuating Reservoir Levels, Erosion, Off-Road Vehicles | Potentially Eligible |
| 1229-H | Rvr | LNF | Mine Shaft, Tailings Ditch | Collapsed Adit, Fire | Ineligible |
| 1465-H | Butte Creek Canal | Private | Ditch | Erosion, Construction, Developments | Ineligible |
| Bcc-4 | Desabla | PG&E | Bcc Camp 3, Possible Ditch Tender's Camp | Vandalism, Overgrown | Ineligible |
| Bcc-5 | Desabla | PG&E, Private | Hupp's Sawmill And Residence | Structures Removed Over 25 Years Ago | Potentially Ineligible |
| Cc-4 | Lower Centerville Canal | Private | Camp 2, Upper Centerville Canal Ditch Tender's Camp | Private Residence Built On Top Of Camp | Ineligible |
| Dc-1/H | Rvr | LNF | Brm, Ls, Hts, Tt | No Observed Impacts | Potentially Eligible |
| Dc-2-H | Rvr | SPI | Fen | Disintegrating With Age | Ineligible |
| Dc-3/H | Rvr | SPI | Brms, Ls, Mid, Hts, Log | Logging Roads | Potentially Eligible |
| Dc-6-H | West Branch Feather River | SPI | Hts | Logging Skid Trail | Ineligible |

| Site No. CA-BUT-XXXX | Location[a] | Land Owner[b] | Description[c] | Impacts | National Register[d] |
|---|---|---|---|---|---|
| Dc-7-H | West Branch Feather River | SPI | Hts | No Observed Impacts | Ineligible |
| Dc-8-H | West Branch Feather River | Private | Hts | Natural Tree Fall, (Probable Snow Breakage), Natural Erosion | Ineligible |
| Dc-9 | Rvr | SPI | Brm | Slight Natural Erosion | Potentially Ineligible |
| Dc-12/H | Rvr | Cal Fish & Game | Ls, Hts | Erosion, Modern Trash, Recent Fire Ring | Potentially Eligible |
| Dc-13/H | Rvr | Cal Fish & Game | Ls, Hts | Logging Skid Trail, Possible Natural Erosion | Potentially Eligible |
| Dc-15 | Rvr | LNF | Brm | No Observed Impacts | Potentially Ineligible |
| Dc-16-H | West Branch Feather River | LNF | Hts | Modern Campground | Ineligible |
| Dc-17/H | West Branch Feather River | LNF | Brm, Hts | Modern Campground, Natural Erosion | Potentially Eligible |

| Site No. CA-BUT-XXXX | Location[a] | Land Owner[b] | Description[c] | Impacts | National Register[d] |
|---|---|---|---|---|---|
| Dc-18-H | West Branch Feather River | LNF | Hts | Natural Tree Fall (Probable Snow Breakage) Recreation Use, Natural Erosion | Ineligible |
| Dc-20-H | Rvr | LNF | His Forest Service Camp | Modern Campground, Horseshoe Pits, Roads | Ineligible |
| Dc-21 | West Branch Feather River | Private | Brm, Ls | Modern Cabin Inhabited On Site, Road, Possible Artifact Collecting Due To Accessibility And Vulnerability Of Surface Artifacts To Site Occupants. | Potentially Eligible |
| Dc-22-H | West Branch Feather River | Private | Dewey Ditch | Portions Of Ditch Filled In And Used As Road, Slash | Potentially Eligible |
| Dc-23-H | Pbr | PG&E | Hts | Natural Tree Fall (Probable Snow Breakage), Possible Logging | Ineligible |
| Dc-24-H | Pbr | PG&E | Hts | Public Access, Natural Tree Fall, Natural Erosion | Ineligible |
| Dc-26-H | Pbr | LNF | Hts | Slash Pile On Top Of Site, Fire Line | Ineligible |
| Dc-29-H | Pbr | PG&E | Hts | Public Access, Pit Manually Excavated Into Cultural Deposit With Artifacts Stacked Around Edge Of Pit, Likely For Artifact Collection | Ineligible |

| Site No. CA-BUT-XXXX | Location[a] | Land Owner[b] | Description[c] | Impacts | National Register[d] |
|---|---|---|---|---|---|
| Dc-32-H | Pbr | LNF | Hts | Public Access, Natural Tree Fall (Possible Heavy Snow Breakage) | Ineligible |
| Dc-34-H | Pbr | LNF | Hts | Public Access, Natural Tree Fall, Natural Erosion, Large Pit (Approx 3ft Deep) Excavated Into Cultural Deposit With Artifacts Stacked Around Edge Of Pit (Looting) | Ineligible |
| Dc-38-H | Pbr | PG&E | Hts | Natural Erosion | Ineligible |
| Dc-39-H | Pbr | PG&E | Hts | Public Access, Natural Erosion | Ineligible |
| Dc-40-H | Pbr | LNF | Mining | Natural Erosion | Ineligible |
| Dc-43-H | Pbr | LNF | Mining | Natural Tree Fall (Possible Heavy Snow Breakage), Possible Natural Erosion | Ineligible |
| Dc-44 | Pbr | LNF | Brm | No Observed Impacts | Potentially Ineligible |
| Dc-46-H | Pbr | LNF | Hts, Philbrook Gate Tender's House | Recreational Use, Logging, Natural Erosion, Vandalism, Of Cabin, Natural Decay | Eligible As Contributing Element Of The Hydroelectric District And Potential Individual Eligibility |

| Site No. CA-BUT-XXXX | Location[a] | Land Owner[b] | Description[c] | Impacts | National Register[d] |
|---|---|---|---|---|---|
| Dc-51/H | West Branch Feather River | Private | Brms, Hts, Cab, Possible Ditch Tenders Cabin | One Cabin Dismantled | Eligible As A Contributing Element Of The Hydroelectric District And Potential Individual Eligibility |
| Dc-52-H | Desabla | PG&E | Psea Camp | Modern Developments And Use Of Camp | Eligible As A Contributing Element And Potential Individual Eligibility |
| Dc-53-H | Desabla | PG&E | Camp 1 | Most Original Structures And Features Are Gone | Eligible As A Contributing Element |

[a] Pbr = Philbrook reservoir ; Rvr = Round Valley reservoir; West Branch Feather River = West Branch Feather River.

[b] Cal Fish & Game = California Division of Fish and Game; LNF = Lassen National Forest; PG&E = Pacific Gas and Electric Company; SPI = Sierra Pacific Industries.

[c] Brm = Bedrock Mortars; Cab = Cabin Site; His = Historic; Hts = Historic Trash Scatter; Log = Logging; Ls = Lithic Scatters; Mid = Midden; Min = Mining; Tt = Turpentine Trees; Forest Service = United States Forest Service.

[d] Pending SHPO Concurrence.

**Historic Structures Identification and National Register Evaluation**

PG&E also conducted an inventory for historic structures within the project's APE. During the historic structures field inventory, all project-related canals, dams, powerhouses, and associated features 45 years of age or older were documented and evaluated. To accomplish this, an architectural historian conducted field inspections of the project area to record or re-record all project features according to current National Park Service standards. Individual elements of the hydroelectric system were photographed in color format and project features were located using a global positioning system receiver, as allowed by weather and terrain. The features were compared to historic construction plans and photographs, when available, to help ascertain integrity and, in part, define the relationships between buildings, other project features, and the APE. The current condition and physical appearance of the features, as well as any evident impacts, were recorded, and maintenance and/or operation activities with the potential to adversely affect National Register-eligible features were identified.

PG&E found that the DeSabla-Centerville hydroelectric system is eligible for nomination to the National Register as a historic district that has contributed to the broad patterns of state and national history. It is significant under all four National Register-criteria[71] because of its association with the development of hydroelectric technology in California; its association with individuals instrumental in the development of the technology in the Pacific West; its distinctive characteristics that exemplify the Western regional style of hydroelectric development; its and its potential to yield information important in history. It also is a significant and distinguishable entity as a system of interconnected dams, reservoirs, canals and powerhouses. Several elements of the system also have been recommended individually for the National Register. Table 3-46 includes a list of features associated with the hydroelectric system and comments regarding their National Register-eligibility.

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[71] The National Park Service, who administers the National Register, developed criteria designed to guide state and local governments, federal agencies, and others in evaluating potential entries to the National Register. To be included in the National register, a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and must meet at least one of the following: A) associated with events that have made a significant contribution to the broad patterns of our history; or B) associated with the lives of persons significant in our past; or C) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or D) have yielded or may be likely to yield, information important in prehistory or history.

Table 3-46. DeSabla-Centerville historic project features and/or proposed historic district contributors. (Source: PG&E, 2007a)

| Site No. (CA-BUT-X) or Temp No. | Feature | Landowner | Components | Construction | Contributing Element of National Register District | Individually Eligible | Individually Ineligible | Comments |
|---|---|---|---|---|---|---|---|---|
| 869-H | Hendrick's Canal | SPI | Tunnels, gates, wasteways, flumes, culverts, L-walls, spillways, gauging stations | 1871-1906 | X | X | | Recommended as eligible for a 12-mile section of the canal that was replaced by a tunnel and is no longer in use |
| 870-H | Centerville powerhouse | PG&E | powerhouse, switchyard, campsite | 1899 | X | X | | Site eligible under Criteria A and B as part of the Centerville powerhouse District (1985); SHPO concurred in 1986 |
| 874-H | Butte Creek Canal | PG&E, BLM, SPI, Private | tunnels, gates, wasteways, flumes, culverts, L-walls, spillways, gauging stations | 1902 | X | X | | Originally built for mining purposes and recommended ineligible as a miner's ditch; as a hydro feature site is evaluated as individually eligible and a contributing element. Potential slide damage may have affected site integrity. |

| Site No. (CA-BUT-X) or Temp No. | Feature | Landowner | Components | Construction | Contributing Element of National Register District | Individually Eligible | Individually Ineligible | Comments |
|---|---|---|---|---|---|---|---|---|
| 875-H | Toadtown Canal | PG&E, BLM, LNF, Private | L-walls, spillways, flumes, wasteways, gauging stations | 1871-1903 | X | | X | Originally built for mining purposes, it was recommended ineligible as a miner's ditch; as a hydro feature site is evaluated as a contributing element. |
| 876-H | Lower Centerville Canal | PG&E, BLM, Private | ditch tender's camps, tunnels, gates, wasteways, flumes, culverts | 1875-1907 | X | X | | Recommended individually eligible as part of the Centerville powerhouse District. Site also is a contributing element of the DeSabla-Centerville district. |
| 891-H | Upper Centerville Canal | PG&E, Private | Canal, gate | 1871 | X | | X | Not individually eligible because it wasn't a key component of the system. |
| | Toadtown powerhouse | Private | powerhouse | 1986 | | | X | Less than 45 years old. |
| | Butte Creek diversion dam | SPI | Dam, ditch tender's camp | 1916 | X | X | | Excellent representative of the Thin Arch Dam architectural type and method of construction. |

| Site No. (CA-BUT-X) or Temp No. | Feature | Landowner | Components | Construction | Contributing Element of National Register District | Individually Eligible | Individually Ineligible | Comments |
|---|---|---|---|---|---|---|---|---|
| | Centerville diversion dam | PG&E | Dam, ditch tender's camp | 1906-1908 | X | | X | Though an integral part of the system, dam design and materials are not unique or representative. |
| | Hendricks Div./ diversion dam | SPI | Dam, gates, fishwheel | Early 1900s | X | | X | Previously evaluated as a wood crib dam rather than the concrete dam associated with the hydroelectric system |
| | Round Valley reservoir | LNF | Reservoir, dam, spillway, gauging stations, and associated features | 1877 | X | | X | Key component of the system but not individually distinctive or representative. |
| | Philbrook reservoir | PG&E, NFSL | Reservoir, dam, spillways, lake tender's campsite, and associated features | 1926 | X | | X | Key component of the system but not individually distinctive or representative. |

| Site No. (CA-BUT-X) or Temp No. | Feature | Landowner | Components | Construction | Contributing Element of National Register District | Individually Eligible | Individually Ineligible | Comments |
|---|---|---|---|---|---|---|---|---|
| | DeSabla powerhouse | PG&E | powerhouse | 1960s | | | X | Less than 45 years old. However, may become eligible for the National Register over any new license term. |
| | DeSabla forebay and dam | PG&E | Dam, reservoir, ditch tender's camp site, old and new intakes, spillway | 1903 | X | | X | Key component of the system but not individually distinctive or representative. |
| | Flumes | Various | Flumes | Various | X | | X | |
| | Penstocks | Various | Penstocks | Various | X | | X | |
| 868-H | Original DeSabla powerhouse site | PG&E | Foundations, pads, trash | 1903 | | | X | Buildings and associated archaeological deposits destroyed |
| 871-H | Camp 2: BCC ditch tender's camp | PG&E | Foundations | 1902 | X | ? | | Potential for buried archaeological deposits; test excavations required to confirm archaeological data potentials |

| Site No. (CA-BUT-X) or Temp No. | Feature | Landowner | Components | Construction | Contributing Element of National Register District | Individually Eligible | Individually Ineligible | Comments |
|---|---|---|---|---|---|---|---|---|
| 873-H | Hogg Ranch camp, possibly LCC Camp 2 | PG&E | Foundations, pads, trash | 1930s-1940s | X | ? | | Potential for buried archaeological deposits; test excavations required to confirm archaeological data potentials |
| BCC-4 | Possible ditch tender's cabin, BCC Camp 3 | PG&E | Garage, fruit trees, fence, rock lined depression | 1920s | | | X | Buildings and associated debris removed, integrity lost |
| BCC-5 | Hupp's Sawmill; possibly BCC Camp 2 | Private | Trash | 1864-1890 | | ? | | Unevaluated; further investigations required |
| CC-4 | LCC Camp 3 | Private | Rock wall remnant | | | | X | Lacks integrity |
| DC-22-H | DC-22-H: Dewey Ditch | Private | Ditch | 1858 | | X | | No longer part of DeSabla Centerville system |

| Site No. (CA-BUT-X) or Temp No. | Feature | Landowner | Components | Construction | Contributing Element of National Register District | Individually Eligible | Individually Ineligible | Comments |
|---|---|---|---|---|---|---|---|---|
| DC-46-H | Philbrook Reservoir Lake Tender's Cabin Site | NFSL | Cabin, other structural remains, trash | 1926 | X | ? | | Potential for buried archaeological deposits; test excavations required to confirm archaeological data potentials |
| DC-52-H | Pacific Service Employees Association Camp | PG&E | Cabins and other facilities | 1920s | X | ? | | Potential for buried archaeological deposits; test excavations required to confirm archaeological data potentials |
| DC-53-H | Camp 1 | PG&E | Original bunkhouse and superintendent house | 1900s | X | | X | Structures removed or modified |

### 3.3.6.2 Environmental Effects

Effects on historic properties (properties eligible or listed on the National Register) within the APE can include, but are not limited to, inundation under the waters of the project reservoirs, the recreational use of the reservoirs and other project lands, vandalism, and modifications or repairs to project facilities. The type and level of effects on cultural resources can vary widely, depending on site location and setting, features and attributes, visibility of the resources, and public knowledge and access to a resource. For our analysis, we consider the effects of continued project operation and the implementation of proposed environmental enhancements on the known historic properties and on potential unanticipated discoveries and human remains.

**Centerville Powerhouse**

PG&E proposes to continue operating the project with no change to generation facilities or features other than adoption of the resource management measures in the license application. The age of the Centerville powerhouse, however, has become prohibitive to efficient power production and PG&E anticipates rebuilding or refurbishing the powerhouse in the next 10 years.

In addition, as part of its proposal for DeSabla-Centerville Hydroelectric Project, the Conservation Groups recommend a phased-in the decommissioning of the Centerville powerhouse, Lower Centerville canal, and lower Centerville diversion dam (collectively, the Centerville Development). The groups did not include any additional recommendations specific to cultural resources outside of what PG&E already proposed.

*Our Analysis*

The DeSabla-Centerville hydroelectric system as a whole, and the Centerville Development's facilities individually, has been evaluated as eligible for inclusion on the National Register. As such, any construction or modification to these structures would need to be done in consultation with the California SHPO and the Commission. The facilities are considered eligible because they are associated with events that have made a significant contribution to the broad patterns of our history and are associated with the lives of persons significant in our past. The Centerville powerhouse also meets the National Register's standards of significance individually and it possesses integrity as a structure that retains the physical characteristics it possessed in the past.

If the Centerville powerhouse were to be rebuilt, refurbished, or decommissioned, PG&E would be required to take its National Register-eligibility status into account and consult with the California SHPO prior to any construction activities. An Historic American Buildings Survey and Historic American Engineering Record documentation would need to be completed to ensure that the structure and its features were recorded for future generations and to mitigate the negative effects upon our history and culture of

rapidly vanishing architectural and engineering resources. As the powerhouse structure possesses both significance and integrity, another option if for PG&E to rehabilitate and refurbish the building for another use, such as a museum. This recommendation would allow the structure to be repurposed for a new use while continuing to remain culturally significant, thus preserving its integrity for future generations to enjoy. While no specific plans have yet been filed, any major modifications to the structure would require appropriate mitigation measures and consultation. The HPMP prepared by PG&E to mitigate for project effects on cultural resources would be the appropriate document in which to include such measures to ensure protections are in place to protect this historic resource.

**Historic Properties Management Plan**

In order to mitigate for project effects on cultural resources, PG&E prepared an HPMP, filed on February 15, 2008, that defines the project APE, describes the project's prehistoric, historic, and ethnographic background, and recommends general and specific treatment measures for the management and protection of historic properties. General measures proposed by PG&E include:

- A preferred action of avoidance of historic properties during operations and maintenance activities;
- public education and employee training;
- the use of regulatory warning and interpretive signs and displays;
- designated travel routes and road closures to avoid historic properties, unless during an emergency or during project facility maintenance;
- development of a road maintenance plan that cites and considers the HPMP;
- consideration and consultation regarding cultural resources during the planning phases of any of all recreation development and improvements;
- establishment of an annual monitoring and condition assessment;
- development of a stabilization and erosion control plan for any sites adversely effected by erosion;
- following all applicable laws and statutes when dealing with the discovery and treatment of human remains;

- consulting with a qualified professional archaeologist and all necessary entities (Tribes, SHPO, federal agencies) when unanticipated discoveries occur;

- notification of all necessary entities when an emergency action has the potential to affect historic properties;

- performing any additional cultural resource inventories in a manner that conforms to contemporary professional standards;

- preparation of an annual report summarizing the results of all historic properties monitoring activities; and

- periodic review and revision of the HPMP.

PG&E's HPMP also includes site specific protection measures for two of the 46 identified sites. For the two sites (CA-BUT-873-H and CA-BUT-3068-H), PG&E recommends blocking public access within 3 years of HPMP approval. For the remaining 44 of the sites, PG&E either identifies no management or no further management beyond annual monitoring and condition assessments.

Four previously identified sites at Round Valley reservoir were re-located and formally surveyed and found to be one continuous scatter of cultural remains. PG&E conducted further study, at the request of the Forest Service, and found that inundation of the resource throughout most of the year and annual draw-down of the reservoir may be adversely affecting the site. As a result, PG&E currently is working with the Commission's Division of Hydropower Administration and Compliance (DHAC) to mitigate for the adverse effect under the current DeSabla-Centerville license. PG&E states that appropriate management measures would be identified in future consultations and addressed in subsequent revisions to the HPMP.

The DeSabla-Centerville hydroelectric project system also has been recorded and recommended as eligible for the National Register as a historic district and several elements of the system have been evaluated as individually eligible on their own merit. In 1986, the SHPO concurred with the eligibility of the system and its associated facilities. In the HPMP, PG&E states that throughout the term of any license issued for the project, activities such as maintenance, repair, alteration, replacement, and any necessary new construction would be performed in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (48 CFR 44738-44739) and in consultation with the California SHPO.

The Forest Service's 4(e) condition 35 requires PG&E to file an HPMP approved by the Forest Service, BLM, and other appropriate agencies within 1 year of license issuance. Condition 35 also requires: 1) PG&E to consult with the California SHPO, applicable Native American Tribes, Forest Service, BLM, and other agencies during the

preparation of the plan; 2) a defined APE; 3) measures to mitigate identified impacts; 4) a monitoring program; and 5) management protocols for the protection of archaeological resources. The Forest Service also states that due to on-going project effects at the potentially eligible Round Valley reservoir (CA-BUT-1225/H) and the proposed removal and impacts to the Lake Tenders Cabin and associated sub-surface site at Philbrook reservoir, the HPMP should include data recovery plans for both of these known and potentially eligible sites, if not completed sooner under existing project planning. The Forest Service states that data recovery is a reasonable alternative to mitigate for continued adverse project effects on these sites. As stated previously, PG&E completed surveys of these sites and currently is working with DHAC to develop measures under the terms of the current license to protect these sites.

BLM, Greenville Rancheria, the Mechoopda Tribe, and the Forest Service sent comments to PG&E on the HPMP and these comments are included with the February 15, 2008, filing. PG&E, however, requested comments on the HPMP by February 8, 2008, which did not leave enough time to allow PG&E to incorporate the comments into the HPMP by the February 15, 2008, filing date required by the Commission. PG&E states that the comments will be addressed during future consultation and revisions to the HPMP.

BLM, in comments sent to PG&E, suggests additional resources PG&E can consult in an attempt to provide a more complete prehistoric and historic context for the project. BLM also requests to be a party to development of interpretive information and any other consultations regarding cultural resources at the project. In addition, BLM requests the amendment to three site records (CA BUT 875 H, CA BUT 876 H, CA BUT 891 H) to indicate that the sites occupy a small portion of BLM land.

In Greenville Rancheria's comments on the HPMP filed with PG&E, the Tribe requests PG&E grant an extension for comments "due to an incomplete HPMP." The Tribe states that formal comments also would be filed when the rest of the HPMP is complete. Greenville Rancheria also filed comments directly with the Commission on June 19, 2008, (dated February 21, 2008) reiterating the belief that the HPMP was incomplete and stating that no written comments would be submitted until the HPMP was completed and submitted for tribal review.

In the Mechoopda Tribe's comments on the HPMP, the Tribe suggests several typographical and semantic corrections and requests clarification on several issues, including who determines when consultation or actions are necessary and whether opportunities to participate in resource stewardship would exist throughout the term of the license. The Tribe suggests several additions to the HPMP, including: 1) the establishment of an consultation group that would meet annually or bi-annually; 2) a dispute resolution section; 3) a paragraph detailing the purpose of the Tribe's consultation and its unique status as a Indian sovereign government for consultation purposes;

4) additional information on the post Euro-American Maidu contact indicating the Tribe's self-sufficiency as a sovereign nation; 5) a collection policy for discovery, curation, and disposition of artifacts; 6) the development of a tribal advisory group for consultation purposes; 7) a section detailing identification, restoration, accessibility, and stewardship collaborations for traditional plant gathering/tending in wetlands and riparian habitat communities and avian species cultural important to participating Tribes; 8) the expansion of employee training to identify the management measure undertaken and to formalize the measure within PG&E's best practices or procedural manuals; 9) updating the signage measures to require 5-year review; and 10) the addition of a section detailing and consolidating the reports and responsibilities of various agencies and participating Tribes relative to the HPMP.

The Forest Service comments that the HPMP should be revised to include: 1) new language regarding the current state of site testing at Round Valley reservoir occurring due to on-going project effects; 2) the inclusion of additional information, including the results of the Forest Service's cultural survey of the West Branch Feather River and information on a newly discovered site along Philbrook creek; 3) more specific general and site-specific treatment measures; 4) development of associated cultural elements (i.e., detailed monitoring plans) as soon as possible; 5) more specific details regarding the influence of other resources on project cultural resources; and 6) measures recommended by entities other than PG&E. The Forest Service states that "decisions in the draft HPMP are only preliminary and not ready for approval." The Forest Service further concludes that the document is in a very early draft template and they look forward to developing the necessary details for long term protection of cultural resources.

*Our Analysis*

The HPMP filed by PG&E, and as required by Forest Service 4(e) condition 35, contains a number of measures to manage and protect historic properties. The avoidance strategies, public and employee training proposals, signage plans, transportation plans, monitoring, consultation, annual report proposals, and the HPMP review proposals are all measures that would ensure cultural resources and historic properties within the project's APE are protected and maintained throughout the term of any license issued for the project. Filing an annual report with the Forest Service, BLM, the California SHPO, the Mechoopda Indian Tribe, and Greenville Rancheria by March 15 of each year and holding an annual meeting between January 1 and March 30 of each year would keep all parties informed and encourage continued consultation. In addition, meeting with the Forest Service, BLM, the California SHPO, the Mechoopda Tribe, and Greenville Rancheria to review and potentially revise the HPMP after 5 years and then again every 10 years would ensure the effectiveness of the document and provide a means to incorporate any new information or practices related to cultural resources. In addition, while the HPMP does not include many site-specific management proposals, the

continued consultation and annual reports would allow for any sites that require specific protection measures to be addressed as necessary.

BLM suggested several revisions to the HPMP, including supplementing the historic context with additional information and ensuring that BLM is included during all consultations. The additional prehistoric and historic information would further complete the cultural record for the project and would help to inform future cultural management practices by allowing for a complete project history. Also, including BLM in all consultations would ensure that BLM expertise was utilized and all historic properties on federal lands were protected.

The Greenville Rancheria deemed the HPMP incomplete, but did not provide any specific comments. Without specific details on why the HPMP is incomplete, it is difficult to assess what additional information may be necessary. Further consultation with the Tribe during HPMP implementation and review would allow for the Tribe to express concerns regarding historic properties and allow PG&E to attempt to address those concerns.

The Mechoopda Tribe made several recommendations in regards to the HPMP that would ensure further protections for cultural resources. The recommended consultation group would ensure continued consultation throughout the term of any new license and already is covered under the February 2008 HPMP. The suggested dispute resolution clause would allow for designated policy for discussion and resolution when disputes arise over cultural resources and is included in the PA issued by the Commission for the project, to which the Tribe would be invited to be a consulting party. The addition of the more detailed information on the Tribe's status would better inform participants of the Tribe's unique standing but would be outside the scope of the HPMP. More detailed information on the Tribe's post Euro-American history would better inform the participants of how the Tribe currently uses the project area and may present ideas for future enhancement measures.

The development of a collection policy for discovery, curation, and disposition of artifacts and an HPMP section detailing identification, restoration, accessibility, and stewardship collaborations for traditional plant gathering/tending in wetlands and riparian habitat communities and avian species cultural important to participating Tribes would be useful in developing methods to ensure project resources are protected. The development of a tribal advisory group for consultation purposes also would assist in ensuring the Tribes continue to be consulted and the project's cultural resources benefit from their expertise.

The recommended expansion of employee training to identify the management measure undertaken and to formalize the measures within PG&E's best practices or procedural manuals would ensure PG&E employees unfamiliar with cultural resources

know exactly what needs to be done to protect historic properties. In addition, review of the project signs every 5 years would ensure the signs always remained up to date. Finally, the addition of an HPMP section detailing and consolidating the reports and responsibilities of various agencies and participating Tribes relative to the HPMP would assist all participants by presenting all the necessary actions and responsibilities in a single, easy-to-find location.

Furthermore, the inclusion of the Forest Service's additional information would further complete the cultural resource record and ensure newly discovered sites are included in the HPMP. The Forest Service also requests more specific general and site-specific treatment measures and the development of associated cultural elements (i.e., detailed monitoring plans) as soon as possible. Developing more specific measures and including them in the HPMP as soon as possible would be the best way to ensure protection of cultural resources, as would the inclusion of more specific details regarding the influence of other resources on project cultural resources and measures recommended by entities other than just PG&E. While the Forest Service states that the HPMP is only a very early draft template, the requests to work toward more specific management measures and more detailed information would be addressed through the continued consultation proposed by PG&E and already included in the HPMP.

The Forest Service's 4(e) condition 35 would require PG&E to file an HPMP within a year of license issuance; however, the HPMP filed by PG&E on February 15, 2008, already addresses many of the issues required by the 4(e) condition. The Forest Service 4(e) condition also requires that the HPMP should include a data recovery plan for the project-affected Round Valley reservoir site (CA-BUT-1225/H). PG&E currently is working with the Commission's DHAC on mitigation measures for this site and the work most likely would be completed by the time a new license is issued. While PG&E may complete the specific mitigation measures by the time a new license is issued, a chance exists that not all necessary work would be completed by that time. Including the site and required mitigation measures within the HPMP would ensure that impacts to CA-BUT-1225/H were properly mitigated.

In July 2009, the Commission will issue a final PA to be executed between the Commission and the California SHPO. The final PA will require PG&E to implement the February 2008 HPMP, along with any required modifications, and includes a dispute resolution clause and a request for the Forest Service, BLM, Greenville Rancheria, and the Mechoopda Tribe to be concurring parties. The final PA will be incorporated into any new license by reference. Execution of the PA and implementation of the February 2008 HPMP with any recommended modifications would ensure that adverse effects of the project on cultural resources would be appropriately mitigated.

We analyze the costs of measures proposed or recommended for cultural resources in section 4, *Developmental Analysis*, and make our final recommendations in section 5, *Comprehensive Development and Recommended Alternative*.

## 3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate as it has in the past. None of the licensee's proposed measures or the resource agencies' recommendations and mandatory conditions would be required.

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# 4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the DeSabla-Centerville Hydroelectric Project's use of the West Branch of the Feather River and Butte Creek for hydropower purposes to see what effect various environmental measures would have on the project's costs and power benefits. Consistent with the Commission's approach to economic analysis, we determine the power benefit of the project by estimating the cost of obtaining the same amount of energy and capacity using the likely alternative generating resources available in the region. In keeping with Commission policy as described in Mead, we base our economic analysis on current electric power cost conditions and do not consider future escalation of fuel prices in valuing the hydropower project's power benefits.[72]

Our analysis includes: (1) an estimate of the net power benefit of the project for each of the licensing alternatives; and (2) an estimate of the cost of individual measures considered in the final EA for the protection, mitigation and enhancement of environmental resources affected by the project. To determine the net power benefit for each of the licensing alternatives, we compare project costs to the value of the power output as represented by the cost of a likely alternative source of power in the region. For any alternative, a positive net annual power benefit indicates that the project power costs less than the current cost of alternative generation resources and a negative net annual benefit indicates that project power costs more than the current cost of alternative generation resources. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

## 4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 4-1 summarizes the assumptions and economic information we use in our analysis. Some of the information was provided by PG&E in its license application. We find that the values provided by PG&E are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); estimated future capital investment required to maintain and extend the life of plant equipment and facilities; relicensing costs; normal operation and maintenance cost; and Commission fees.

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[72] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995).

Table 4-1. Parameters for economic analysis of the DeSabla-Centerville Hydroelectric Project. (Source: PG&E and staff)

| Assumption | Value | Source |
|---|---|---|
| Energy value (2008$)[a] | 87.11 mills/kWh | PG&E |
| Capacity value (2008$) | Included in energy value | |
| Net investment | $31,400,000 | PG&E |
| Cost of capital | 8.79 percent | PG&E |
| Discount rate | 8.79 percent | Staff |
| State and federal income tax rate | 40.75 percent | PG&E |
| Local tax rate | 3 percent | Staff |
| Insurance rate | 0.25 percent of initial net investment | Staff |
| Term of financing | 20 years | Staff |
| Period of analysis | 30 years | Staff |
| Operation and maintenance | $2,500,000 | PG&E |
| FERC fees | $120,000 | PG&E |
| Escalation rate after 2006 | 0 percent | Staff |
| Relicensing costs | $14,500,000 | PG&E |
| Construction period | 1 year | Staff |
| Depreciation | 20-year public utility depreciation | Staff |
| No-action average annual generation (GWh) | 151.5 | PG&E |
| No-action dependable capacity (MW) | 7.9 | PG&E |

[a] The energy value is based on average of the short run avoided costs for PG&E for 2008. Monthly values were obtained from http://www.pge.com/b2b/energysupply/qualifyingfacilities/prices/ and averaged to come up with an annual value for project power.

## 4.2 COMPARISON OF ALTERNATIVES

Table 4-2 compares the power value, annual costs, and net benefits for the no-action alternative, PG&E's proposal, the staff alternative for the DeSabla-Centerville

Hydroelectric Project, and the staff alternative with mandatory measures which are discussed in details in sections 1, 2, and 3, respectively. Table 4-3 shows the effect on costs and power values of individual measures proposed by PG&E and recommended by others, and considered by staff for inclusion in the staff alternative. In section 5.2, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for including key measures in the staff alternative and why we consider the environmental benefits to be worth these costs.

Table 4-2. Summary of the annual net benefits in 2008 dollars for PG&E's proposal, the staff alternative, the staff alternative with mandatory conditions, and the no-action alternative for the DeSabla-Centerville Hydroelectric Project. (Source: Staff)

| | **No-action** | **PG&E's Proposal** | **Staff Alternative** | **Staff Alternative with Mandatory Measures** |
|---|---|---|---|---|
| Installed capacity (kW) | 26,700 | 26,700 | 26,700 | 26,700 |
| Annual generation (GWh) | 151.5 | 146.20 | 148.79 | 142.47 |
| Annual power value | $13,197,000 | $12,735,000 | $12,961,000 | $12,410,000 |
| (mills/kWh) | 87.11 | 87.11 | 87.11 | 87.11 |
| Annual cost | $7,994,000 | $12,456,000 | $14,672,000 | $15,050,000 |
| (mills/kWh) | 52.76 | 85.20 | 98.61 | 105.64 |
| Annual net benefit | $5,203,000 | $279,000 | ($1,711,000) | ($2,640,000) |
| (mills/kWh) | 34.34 | 1.91 | (11.50) | (18.53) |

### 4.2.1 Power and Economic Benefits of the No-action Alternative

Under the no-action alternative, the DeSabla-Centerville Hydroelectric Project would include all of the facilities that are included under the current license. The project would continue to operate as currently operated. The project would continue to generate an average of 151.5 GWh of electricity annually, have an annual power value of $13,197,000 (87.11 mills/kWh), and total annual costs of $7,994,000 (52.76 mills/kWh), resulting in a net annual benefit of $5,203,000 (34.34 mills/kWh).

### 4.2.2 Power and Economic Benefits of PG&E's Proposal

As proposed by PG&E, the DeSabla-Centerville Hydroelectric Project would generate an average of 146.2 GWh of electricity annually, have an annual power value of $12,735,000 (87.11 mills/kWh), and total annual costs of $12,456,000 (85.20 mills/kWh), resulting in a net annual benefit of $279,000 (1.91 mills/kWh).

### 4.2.3 Power and Economic Benefits of the Staff Alternative

Resource agencies and non governmental organizations recommended implementing a variety of measures at the project. We reviewed each recommendation and determined the measures that were most appropriate for implementation. We also considered other recommendations that are warranted for inclusion in a new license to protect and enhance project resources.

The staff alternative project would generate an average of 148.79 GWh of electricity annually, have an annual power value of $12,961,000 (87.11 mills/kWh), and total annual costs of $14,672,000 (98.61 mills/kWh), resulting in a negative net annual benefit of $1,711,000 (11.50 mills/kWh).

### 4.2.4 Power and Economic Benefits of the Staff Alternative with Mandatory Conditions

FWS and the Forest Service have specified conditions in accordance with 4(e) of the FPA; these conditions will be included in any license issued to PG&E for the DeSabla-Centerville Hydroelectric Project. The staff alternative with mandatory conditions includes those measures, and would in some cases; the mandatory conditions replace staff-recommended measures. Under this alternative, the project would generate an average of 142.47 GWh of electricity annually, have an annual power value of $12,410,000 (87.11 mills/kWh), and total annual costs of $15,050,000 (105.64 mills/kWh), resulting in a negative net annual benefit of $2,640,000 (18.53 mills/kWh).

## 4.3 COST OF ENVIRONMENTAL MEASURES

Table 4-3 gives the cost of each of the environmental measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 4-3. Summary of capital costs, annual costs, annual energy costs, and total annualized costs of environmental measures proposed by PG&E and recommended by others and considered by staff for inclusion in the staff alternative for the DeSabla-Centerville Hydroelectric Project. (Source: Staff)

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| **General Resource Measures** | | | | | | | | |
| 1 | Train employees annually regarding location of sensitive areas, general identification of special-status species and invasive weeds, process if sensitive species might be disturbed, reporting procedures to Forest Service and other agencies. | PG&E, Staff | no | $0 | $20,000 | $20,000 | yes | |
| 2 | Consultation - annually meet with the Forest Service regarding proposed project O&M for the upcoming year and file a letter report including evidence of consultation within 60 days of the meeting. | PG&E, Staff | no | $0 | $10,000 | $10,000 | yes | |
| **Water Quantity and Aquatic Resource Measures** | | | | | | | | |
| 1 | Modify minimum instream flow releases if required by equipment malfunction, law enforcement, emergencies, or by the request of resource agencies, and provide notice and an explanation to the Commission no later than 10 days after the incident. | PG&E, Forest Service, FWS, NMFS, Staff | no | $0 | $0 | $0 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 2 | Promptly resume performance of license requirements following a modified minimum instream flow release and notify the resource agencies within 48 hours. | Forest Service, FWS, NMFS, Staff | no | $0 | $0 | $0 | yes | |
| 3 | Schedule maintenance or other planned outages to avoid negative ecological effects and provide notice to the Forest Service at least 90 days prior any outage. | Forest Service, Staff | yes | $0 | $0 | $0 | yes | |
| 4 | Complete facility modifications needed for the release of minimum instream flows as soon as possible, but no longer than 3 years after license issuance. | PG&E, Forest Service, FWS, NMFS, Staff | yes | $0 | $0 | $0 | yes | Included in PG&E's costs. |
| 5 | Release a minimum instream flow of 0.5 cfs, or inflow, whichever is less, during normal water year types, and 0.1 cfs, or inflow, whichever is less, during dry water year types, on a year-round basis downstream of Round Valley reservoir dam. | PG&E, Forest Service, FWS, Cal Fish & Game, Staff | yes | $0 | $0 | $0 | yes | |
| 6 | Release a minimum instream flow of 2 cfs, or inflow, to Philbrook Creek during normal and dry water year types. | PG&E, Forest Service, FWS, Cal Fish & Game, Staff | yes | $0 | $0 | $0 | yes | |
| 7 | If inflow into Philbrook reservoir is less than 1 cfs, a minimum instream flow of at least 1 cfs would be discharged into | FWS | no | $0 | $0 | $0 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| | Philbrook Creek. | | | | | | | |
| 8 | If inflows into Philbrook reservoir are less than 0.5 cfs, the mean daily minimum instream flow released to Philbrook Creek shall be 1 cfs. | Forest Service, Staff | yes | $0 | $0 | $0 | yes | |
| 9 | Release a minimum instream flow of 10 cfs between April 1st and May 15th to Philbrook Creek based in wet water years based on snow pack levels. | PG&E, Forest Service, FWS, Cal Fish & Game, Staff | yes | $0 | $0 | $0 | yes | |
| 10 | Release the following minimum instream flows downstream of Hendricks diversion dam, for a normal water year: June 1 to February 28/29: 20 cfs; March 1 to May 31: 30 cfs and for a dry water year: June 1 to February 28/29: 7 cfs; March 1 to May 31: 20 cfs. | PG&E | no | $0 | $0 | $243,900 | no | Cost based on an estimated energy loss of 2.80 GWh |
| 11 | Release the following minimum instream flows downstream of Hendricks diversion dam, for a normal water year: September 1 to Feb. 28/29: 20 cfs; March 1 to August 31: 30 cfs and for a dry water year: March 1 to May 31: 20 cfs; June 1 to August 31: 15 cfs; September 1 to February 28/29: 7 cfs. | Forest Service, FWS, Cal Fish & Game | yes | $0 | $0 | $470,400 | no | Cost based on an estimated energy loss of 5.40 GWh. |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 12 | Release the following minimum instream flows to West Branch Feather River downstream of Hendricks diversion dam: for a normal water year release a minimum instream flow of 15 cfs, and for a dry water year release a year round minimum instream flow of 7 cfs. | Staff | no | $0 | $0 | $0 | yes | |
| 13 | Release minimum instream flows downstream of Hendricks diversion dam consistent with PG&E's proposal (above), except in dry years increase minimum instream flows from June 1 to August 31 to 15 cfs. | Conservation Groups | no | | | $0 | no | |
| 14 | Flows made available through minimum instream flow release at Hendricks diversion dam should be maintained within the West Branch Feather River downstream along the natural stream course to its discharge at the high-water line of Lake Oroville. | Forest Service, Cal Fish & Game | no | $0 | $0 | $0 | no | |
| 15 | Make a good faith effort to ensure that minimum instream flows measured at the gage immediately downstream of Hendricks diversion dam (PG&E gage no. BW 95) are not diverted from the West Branch Feather River through methods under the control of PG&E, for any | Forest Service | no | $0 | $0 | $0 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| | purpose. | | | | | | | |
| 16 | Consult with the Water Board and other agencies to identify water rights associated with the diversion of water from the West Branch Feather River and file with the Water Board, petitions to change the purpose of use for existing water rights held by PG&E that define the West Branch Feather River as an authorized point of diversion. | Forest Service, Cal Fish & Game | no | $10,000 | $0 | $1,700 | no | |
| 17 | Release the following minimum instream flows downstream of Butte diversion dam for a normal water year: March 1 to May 31: 30 cfs; June 1 to February 28/29: 16 cfs; and for a dry water year: March 1 to May 31: 20 cfs; June 1 to February 28/29: 7 cfs. | PG&E | no | $0 | $0 | $0 | no | |
| 18 | Release the following minimum instream flows downstream of Butte diversion dam for a normal water year: March 1 to May 31: 30 cfs; June 1 to February 28/29: 16 cfs; and for a dry water year: March 1 to May 31: 20 cfs; June 1 to February 28/29: 10 cfs. | Forest Service, FWS, Cal Fish & Game, Staff | no | $0 | $0 | $8,700 | yes | Cost based on an estimated energy loss of 0.10. GWh. |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 19 | Release the following minimum instream flows downstream of Lower Centerville diversion dam for a normal water year: September 15 to January 31: 75 cfs; February 1 to May 31: 80 cfs; June 1 to September 14: 40 cfs and for a dry water year: September 15 to January 31: 60 cfs; February 1 to April 30: 75 cfs; May 1 to May 31: 65 cfs; June 1 to September 14: 40 cfs. | PG&E, Staff | no | $0 | $0 | $209,100 | yes | Cost based on an estimated energy loss of 2.40 GWh. |
| 20 | Release the following minimum instream flows downstream of Lower Centerville diversion dam for a normal water year: September 15 to March 14: 100 cfs; March 15 to May 31: 80 cfs; June 1 to September 14: 40 cfs and for a dry water year: May 1 to May 31: 65 cfs; June 1 to September 14: 40 cfs; September 15 to April 30: 75 cfs. | Forest Service, FWS, NMFS, Cal Fish & Game | no | $0 | $0 | $383,300 | no | Cost based on an estimated energy loss of 4.40 GWh. |
| 21 | Decommission Centerville powerhouse over a 5 year period with transitional project operation managed by PG&E and the Operations Group. | Conservation Groups | no | $800,000 | | $136,900 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 22 | During the decommissioning, beginning each June 15, divert into Lower Centerville canal only the minimum amount of water needed to prevent damage to this canal, and continue to operate Lower Centerville canal according to this exigency until at least the following February 15. | Conservation Groups | no | $0 | $7,472 | $7,500 | no | |
| 23 | After powerhouse decommissioning, decommission the Centerville development, including removal of Lower Centerville diversion dam and Lower Centerville canal. | Conservation Groups | no | $900,000 | | $154,000 | no | |
| 24 | Develop a plan for the disposition of Centerville powerhouse and should the agencies determine that decommissioning is counter-productive, the Commission would initiate a proceeding for the explicit purpose of determining the minimum instream flow for the Lower Centerville bypassed reach. | Conservation Groups | no | $100,000 | | $17,100 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 25 | Release a minimum instream flow of 0.25 cfs or inflow, whichever is less, during normal water year types, and 0.1 cfs or inflow, whichever is less, during dry water year types, on a year-round basis downstream of the Inskip, Kelsey, Little West Fork and Cunningham Ravine Creek diversion dams. | PG&E | no | $0 | $0 | $0 | no | |
| 26 | Release a minimum instream flow of 0.25 cfs or inflow, whichever is less, during normal water year types, and 0.2 cfs or inflow, whichever is less, during dry water year types, on a year-round basis downstream of the Inskip, Kelsey, Little West Fork and Cunningham Ravine Creek diversion dams. | Staff | no | $0 | $0 | $0 | yes | |
| 27 | Release a minimum instream flow of 1 cfs or natural flow during normal water year types and 0.5 cfs or natural flow during dry water year types to Helltown Ravine. | Staff | no | $0 | $0 | $9,600 | yes | Cost based on an estimated energy loss of 0.11 GWh. |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 28 | Release a minimum instream flow of 1 cfs or natural flow during normal water year types and 0.5 cfs or natural flow during dry water year types downstream of the Inskip (10a), Kelsey (10a), Clear (10a) and Helltown Ravine (10a) Creek diversion dams, and stop diverting water once flows upstream of this diversion reach 1 cfs. | FWS, Forest Service | no | $0 | $0 | $276,000 | no | Cost based on an estimated energy loss of 3.17 GWh. |
| 29 | Release a minimum instream flow of 1 cfs or natural flow during normal water year types and 0.5 cfs or natural flow during dry water year types downstream of Long Ravine, Little West Fork, Cunningham diversions. | FWS, Cal Fish & Game | no | $0 | $0 | $113,200 | no | Cost based on an estimated energy loss of 1.30 GWh. |
| 30 | Release a minimum instream flow of 0.5 cfs or inflow, whichever is less, during normal water year types, and 0.25 cfs or inflow, whichever is less, during dry water year types, downstream of the diversion dam on Clear Creek and Long Ravine. | PG&E, Staff | no | $0 | $0 | $0 | yes | |
| 31 | Provide a year-round minimum instream flow of 1 cfs to Helltown Ravine if the Conservation Groups alternative is not adopted (regardless of water year type). | Conservation Groups | no | $0 | $0 | $19,200 | no | Cost based on an estimated energy loss of 0.22 GWh. |
| 32 | Provide a minimum instream flow of between 0.75 and 0.2 cfs to Long Ravine, | Forest Service | yes | | | $80,000 | no | Cost based on an estimated |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| | Cunningham, and Little West Fork creeks. | | | | | | | energy loss of 0.92 GWh. |
| 33 | Remove feeder diversions on Oro Fino Ravine, Emma Ravine, Coal Claim Ravine, Stevens, and Little Butte creeks and Lake Tender House. | PG&E, California Fish & Game | no | $80,000 | $0 | $13,700 | no | We agree with PG&E's on removal of the structures, but first they must develop a removal plan. |
| 34 | Develop and implement a feeder creek diversion facility removal plan for Stevens, Little Butte, Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine creeks. | Forest Service, FWS, Staff | no | $80,000 | $0 | $13,700 | yes | We recommend that Little Butte Creek be included in this plan. |
| 35 | Notify Cal Fish & Game prior to any ground disturbing activities related to removing the feeder diversions. | Cal Fish & Game, Staff | no | $0 | $0 | $0 | yes | We also recommend that notification be provided to the Commission, Forest Service, SWRCB, Interior, and NMFS |

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|---|---|---|---|---|---|---|---|---|
| 36 | Implement an instream flow-ramping rate study. | Forest Service, Staff | yes | $75,000 | $0 | $12,800 | yes | |
| 37 | Control upramping in lower Butte Creek so that velocity does not change more than 0.2 foot per second per hour. | NMFS, Staff | no | $0 | $0 | $0 | yes | |
| 38 | Develop, in consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and implement upon Commission approval, a ramping rate plan. | Staff | no | $50,000 | $2,000 | $10,600 | yes | |
| 39 | Ramping rates shall be based on changes in water velocity and stage in foothill yellow-legged frog breeding areas in upper Butte Creek, downstream of the Butte Creek diversion dam, and in lower Butte Creek, downstream of Lower Centerville diversion dam. | FWS, Staff | no | $0 | $0 | $0 | yes | |
| 40 | Utilize information from foothill yellow-legged frog population monitoring to determine the timing and to assess the level of allowable stream flow change that causes minimal loss of foothill yellow-legged frog egg masses or tadpoles. | FWS, Staff | no | $0 | $500 | $500 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 41 | Results from the fish and foothill yellow-legged frog monitoring plans would be reviewed by the resource agencies and the Commission to determine if the ramping criteria is protective of the fish and foothill yellow-legged frog populations or if there is a need for modification. | FWS, Staff | no | $0 | $500 | $500 | yes | PG&E should also be included in the review of monitoring results. |
| 42 | Consult with the resource agencies to determine more appropriate ramping rates if monitoring indicates required rates are insufficient. | FWS, NMFS, Staff | no | $0 | $500 | $500 | yes | |
| 43 | Up- and downramping rates, downstream of Hendricks diversion dam, shall be limited to: April-October-0.1 foot per hour, November-March-0.2 foot per hour. | PG&E | no | $0 | $0 | $0 | no | |
| 44 | Schedule canal outages as early in the spring as possible to protect aquatic species. | PG&E, Conservation Groups, Staff | no | $0 | $0 | $0 | yes | |
| 45 | In the case of equipment malfunction, emergency and law enforcement activity, and critical electric system emergencies beyond the control of PG&E, PG&E would communicate with the Forest Service as soon as practicable. | PG&E, Staff | no | $0 | $0 | $0 | yes | Notification should also be provided to the Commission, SWRCB, Interior, Cal Fish & Game, |

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| | | | | | | | | and NMFS. |
| 46 | Provide notice to the resource agencies and the Commission of the final water year type determination within 30 days of making the determination. | Forest Service, Cal Fish & Game, FWS, NMFS, Staff | yes | $0 | $0 | $0 | yes | |
| 47 | By March 15 of the second or subsequent dry water year, notify the resource agencies of drought concerns and by May 15 of the same year, consult with the resource agencies to discuss the project's operational plans to manage the drought conditions. | Forest Service, Cal Fish & Game, FWS, NMFS, Staff | yes | $0 | $500 | $500 | yes | |
| 48 | Implement a revised operational drought plan if agreed upon by the resource agencies. | Forest Service, Cal Fish & Game, FWS, NMFS, Staff | yes | $0 | $0 | $0 | yes | Prior to implementing, PG&E must receive Commission approval prior. |
| 49 | Implement minimum instream flows triggered by water year types within two business days after DWR Bulletin 120 is published. | PG&E, Forest Service, FWS, NMFS, Cal Fish & Game, Staff | yes | $0 | $0 | $0 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 50 | Install and maintain, in consultation with USGS, a flow data logger for measuring stream flow downstream of Hendricks diversion dam, a real-time flow gaging station upstream of Butte Creek diversion dam, and modify the existing gaging station near Lower Centerville diversion dam for real-time data access. | PG&E, Forest Service, FWS, NMFS, Cal Fish & Game, Staff | no | $160,000 | $10,000 | $37,400 | yes | |
| 51 | Install a new gaging station with real-time capability of reading river stage and minimum instream flows downstream of the confluence of both the low level release and spill channel in Philbrook Creek. | Forest Service, FWS, NMFS, Staff | yes | $80,000 | $3,300 | $17,000 | yes | |
| 52 | Operate and maintain the existing gages on the West Branch Feather River located downstream of Round Valley reservoir and Hendricks diversion dam, consistent with all requirements of the Commission and under the supervision of USGS. | PG&E, Forest Service, FWS, NMFS, Staff | yes | $0 | $6,600 | $6,600 | yes | |
| 53 | Make stream flow and reservoir data available to the public and in readily accessible formats, be provided to the USGS and to the agencies upon request. | PG&E, Forest Service, Staff | yes | $0 | $2,500 | $2,500 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 54 | Measure minimum instream flows as the 24-hour average of the flow and as instantaneous flow. | Forest Service, Cal Fish & Game, NMFS, FWS, Staff | yes | $0 | $0 | $0 | yes | |
| 55 | As part of a long-term project operations plan, install a real-time water temperature and reservoir elevation gage in Philbrook reservoir. | NMFS, Staff | no | $80,000 | $3,300 | $17,000 | yes | |
| 56 | The minimum instantaneous 15-minute stream flow shall be at least 80 percent of the prescribed mean daily flow for those minimum stream flows less than or equal to 10 cfs and at least 90 percent of the prescribed mean daily flow for those minimum stream flows required to be greater than 10 cfs. Should the mean daily flow as measured be less than the specified mean daily flow but more than the instantaneous flow, release the equivalent under-released volume of water within 7 days of discovery of the under-release. | Forest Service, FWS, NMFS, Staff | yes | $0 | $0 | $0 | yes | |
| 57 | Instantaneous instream flows may deviate below the specified minimum instream flow releases by up to 10 percent or 3 cfs, whichever is less. | PG&E, FWS, NMFS, Staff | no | $0 | $0 | $0 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 58 | Install new gaging stations downstream of the feeder diversion dams on Inskip, Kelsey, Clear, Helltown Ravine, Long Ravine, Cunningham Ravine, Little West Fork, and Little Butte creeks. | FWS, NMFS | no | $560,000 | $26,400 | $122,200 | no | |
| 59 | Install three pipes in the Hendricks/Toadtown Canal to deliver minimum instream flows into Long Ravine, Cunningham Ravine, and Little West Fork creeks. | Forest Service | yes | $10,000 | $1,000 | $2,710 | no | |
| 60 | Install new gaging stations downstream of the diversion dams on Inskip, Kelsey, Clear, Helltown Ravine, and Little Butte creeks. | Forest Service | no | $400,000 | $5,500 | $74,000 | no | |
| 61 | Maintain a minimum pool level of 250 acre-feet in Philbrook reservoir. | PG&E, Forest Service, FWS, Staff | yes | $0 | $1,000 | $1,000 | yes | |
| 62 | Operate the project reservoirs in consultation with the Operations Group. | Conservation Groups, Staff | no | $0 | $500 | $500 | yes | Prior to implementing, PG&E must receive Commission approval. |
| 63 | Include the Water Board and the Conservations Groups as representatives of the Operations Group. | Conservation Groups, Staff | no | $0 | $0 | $0 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 64 | Monitor water quality in receiving streams during canal outages and provide a summary of cleaning and maintenance activities as well as the monitoring results to the Water Board and the Commission. | PG&E, Staff | no | $0 | $22,000 | $22,000 | yes | |
| 65 | Install four turbidity sensors in Butte Creek. | Conservation Groups | no | $60,000 | $16,200 | $26,500 | no | |
| 66 | Develop and implement a hazardous substances plan. | PG&E, Forest Service, Staff | yes | $10,000 | $1,200 | $2,900 | yes | |
| 67 | Obtain approval for the use of pesticides and implement restrictions on their use. | BLM, Forest Service, Staff | yes | $0 | $0 | $0 | yes | |
| 68 | Develop and implement a DeSabla forebay water temperature improvement plan that provides for the installation of a pipe to convey water from the terminus of Butte canal to the DeSabla forebay intake. | PG&E, Forest Service, FWS, NMFS, Cal Fish & Game, Conservation Groups, Staff | no | $5,309,000 | $10,000 | $918,600 | yes | |
| 69 | Monitor water temperatures in Butte Creek and DeSabla forebay for a period of 5 years after a temperature improvement facility is operating and submit annual reports. | Cal Fish & Game, Staff | no | $15,000 | $2,242 | $4,800 | yes | |
| 70 | Provide a roving operator to check on flow releases made at feeder diversions. | PG&E, Staff | no | $0 | $20,000 | $20,000 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 71 | If the expected temperature benefits have been realized in Butte Creek, resource agencies shall determine whether it is feasible to go forward with flow increases in the West Branch Feather River and/or in Butte Creek. | Cal Fish & Game | no | $0 | $0 | $0 | no | |
| 72 | Develop and implement a water temperature monitoring plan in consultation with Interior, NMFS, Cal Fish & Game, the Water Board, and the Commission to be included in the annual Project Operations and Maintenance Plan. | Forest Service, FWS, NMFS, Staff | yes | $6,000 | $28,000 | $29,000 | yes | |
| 73 | Fish rescue plan and annual implementation in all project canals. | PG&E | no | $12,000 | $8,000 | $10,000 | no | |
| 74 | Fish rescue plan and annual implementation within Butte Creek and Lower Centerville canal. | Staff | no | $12,000 | $4,000 | $10,000 | yes | |
| 75 | Fish rescue plan with implementation twice annually. | Forest Service, NMFS | no | $12,000 | $8,000 | $10,100 | no | |
| 76 | Fish rescue plan with annual implementation until fish screens are installed, assumed to occur in years 1 and 2. | Forest Service, FWS, Cal Fish & Game, Conservation Groups, Staff | no | $0 | $674 | $670 | yes | |

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|---|---|---|---|---|---|---|---|---|
| 77 | Install and operate fish screening at Hendricks Head dam. | Cal Fish & Game, FWS, CSSA, Conservation Groups, FES, Forest Service | no | $1,054,200 | $25,000 | $205,400 | yes | |
| 78 | Install and operate fish screening at Lower Centerville diversion dam. | NMFS, Forest Service, CSSA, Conservation Groups, Cal Fish & Game | no | $2,994,600 | $25,000 | $537,500 | no | |
| 79 | Install and operate fish screening at Butte Creek Head dam. | CSSA | no | $1,029,000 | $25,000 | $201,100 | no | |
| 80 | Install and operate fish ladder at Hendricks Head dam. | Cal Fish & Game, FWS, Conservation Groups, Forest Service | no | $740,600 | $5,000 | $131,700 | yes | |
| 81 | Conduct trout population monitoring in the vicinity of Hendricks Head dam for a minimum of 6 years (3 dry and 3 normal), we estimate that 1 in 5 years would be classified as a dry year; therefore, we assume sampling in years 1, 2, 3, 4, 7 and 12 of new license for cost calculations. | Forest Service | yes | $20,000 | $3,747 | $7,200 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 82 | PG&E's alternative 4(e) 19 to conduct trout population monitoring in the vicinity of Hendricks Head dam in for a minimum of 8 years of monitoring, with a minimum of 3 normal and 3 dry years. We estimate that 1 in 5 years would be classified as a dry year; therefore, we assume sampling in years 1, 2, 3, 4, 5, 6, 10, and 15 of new license for cost calculations. | PG&E | no | $18,000 | $4,694 | $7,800 | no | |
| 83 | Resident fish monitoring in the West Branch Feather River in years 5, 6, 11, 12, 17, 18, 23, 24, and 29. | Forest Service | yes | $18,000 | $6,581 | $9,700 | no | |
| 84 | Resident fish monitoring in Butte Creek and the West Branch Feather River in years 3, 8, 13, 18, 23, and 28. | Staff | no | $30,000 | $7,897 | $13,000 | yes | |
| 85 | PG&E's alternative to 4(e) 20 for resident fish monitoring in the West Branch Feather River, in years 5, 6, 11, 12, 17, 18, 23, 24, and 29 (absent survey site 43.6). | PG&E | no | $18,000 | $6,581 | $9,700 | no | |
| 86 | Resident fish monitoring in all project affected stream reaches and reservoirs. Monitoring in years 1, 2, 5, 6, 10, 11, 15, 16, 20, 21, 25, and 26. | FWS | no | $30,000 | $67,818 | $73,000 | no | |

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|---|---|---|---|---|---|---|---|---|
| 87 | Resident fish monitoring in Butte Creek. The Forest Service does not specify the sampling frequency so we assume it is to be consistent with its 4(e) 20 and sampling would occur in years 5, 6, 11, 12, 17, 18, 23, 24, and 29. | Forest Service | no | $18,000 | $6,581 | $9,700 | no | |
| 88 | Resident fish monitoring in Butte Creek. Monitoring in years 1, 2, 5, 6, 10, 11, 15, 16, 20, 21, 25, and 26. | NMFS | no | $18,000 | $11,904 | $15,000 | no | |
| 89 | West Branch Feather River resident fish monitoring in project effected stream reaches. Monitoring expected to occur in years 5 and 6, and maybe again in 11 and 12. | Staff | no | $15,000 | $2,918 | $5,500 | yes | No cost included for possible monitoring in years 11 and 12. |
| 90 | Butte Creek resident fish monitoring in project effected stream reaches. Monitoring expected to occur in years 5 and 6, and maybe again in 11and 12. | Staff | no | $15,000 | $2,918 | $5,500 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 91 | Annually monitor the ESA-listed spring-run Chinook salmon and the Central Valley steelhead in Butte Creek, including annual snorkel surveys to monitor adult distribution and abundance, annual pre-spawn mortality surveys, and annual carcass surveys to monitor spawning, and juvenile emergence and outmigration monitoring in extreme dry years. | PG&E, NMFS, FWS, Cal Fish & Game, Conservation Groups, Forest Service, Staff | no | $30,000 | $134,600 | $139,700 | yes | |
| 92 | Monitor movement patterns of adult Chinook salmon in response to changes in project flows, and the monitoring of Chinook holding habitat and spawning gravels. (For our economic analysis, we assume monitoring would occur in years 1 and 2). | Cal Fish & Game, Staff | no | $5,000 | $2,528 | $3,400 | yes | |
| 93 | Benthic macroinvertebrate monitoring in project-affected bypassed reaches on West Branch Feather River in years 1 through 4, and 8, 12, 16, 20, 24, and 29. | Forest Service, FWS, NMFS | yes | $20,000 | $25,545 | $29,000 | no | |
| 94 | Benthic macroinvertebrate monitoring in project-affected bypassed reaches in years 1, 3, 5, 11, 17, 23, and 29. | PG&E | no | $20,000 | $32,736 | $36,200 | no | |

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|---|---|---|---|---|---|---|---|---|
| 95 | West Branch Feather River benthic macroinvertebrate monitoring in project-affected bypassed reaches in years be conducted in years 1, 2, 3, and 4, but for a maximum of 2 years per water year type and then in each year of our recommended resident fish population monitoring, beginning in year 5 (e.g. also in years 5 and 6). | | no | $10,000 | $22,963 | $24,700 | no | |
| 96 | Butte Creek benthic macroinvertebrate monitoring in project-affected bypassed reaches conducted in years 1, 2, 3, and 4, but for a maximum of 2 years per water year type and then in each year of our recommended resident fish population monitoring, beginning in year 5 (e.g. also in years 5 and 6). | | no | $20,000 | $45,926 | $49,300 | no | |
| 97 | Butte Creek and West Branch Feather River benthic macroinvertebrate monitoring in project-affected bypassed reaches conducted in years 3, 8, 13, 18, 23, and 28. | Staff | no | $20,000 | $21,150 | $24,600 | yes | |
| 98 | Annual consultation meeting with the Forest Service and other interested resource agencies/parties. | PG&E, Forest Service, Staff | yes | $0 | $10,000 | $10,000 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 99 | Long-term operations plan. | PG&E, Forest Service, FWS, Cal Fish & Game, Staff | yes | $10,000 | $5,000 | $6,700 | yes | |
| 100 | Comprehensive monitoring report with adaptive management summary. | Cal Fish & Game, Staff | no | $20,000 | $0 | $3,400 | yes | |
| 101 | Hendricks canal fish entrainment study to be conducted, simultaneously with the trout population monitoring (Forest Service 4(e) 19), and for minimum of 4 years (2 dry and 2 normal), we estimate that 1 in 5 years would be classified as a dry year; therefore, we assume sampling in years 1, 2, 5 and 10 of new license for cost calculations. | Forest Service | no | $15,000 | $13,618 | $16,200 | no | |
| 102 | West Branch Feather River fish migration study (radio telemetry, with 400 tags) to be implemented in years 1, 2, 3, and 4. | Forest Service | no | $45,000 | $15,546 | $23,200 | no | |
| 103 | Develop a fish passage plan providing for the continuous operation of the fish ladder and providing passage and connectivity in West Branch Feather River in normal and dry water year types. | Staff | no | $15,000 | $0 | $2,600 | yes | |

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|---|---|---|---|---|---|---|---|---|
| **Terrestrial Resource Measures** | | | | | | | | |
| 1 | Invasive weed management and vegetation management plan, excludes PG&E and private lands located within the project boundary. | PG&E, Forest Service, FWS, Cal Fish & Game, Staff | yes | $5,000 | $30,000 | $30,900 | yes | |
| 2 | Invasive weed management and vegetation management plan and the plan is expanded to accessible project lands outside the National Forest. | FWS, Staff | no | $5,000 | $20,000 | $20,900 | yes | |
| 3 | Annual review of the current list of federally listed species and Forest Service sensitive or Lassen and Plumas National Forest species and development of protective measures for the project lands located in national forest. | PG&E, Forest Service, Staff | yes | $0 | $2,500 | $2,500 | yes | |
| 4 | Annual review of the current list of federally listed species and special status species and development of protective measures expanded to project lands located outside of national forest. | Staff | no | $0 | $2,500 | $2,500 | yes | |
| 5 | Monitor foothill yellow-legged frog proposed by PG&E. | PG&E | no | $10,000 | $20,191 | $21,900 | no | |
| 6 | Monitor foothill yellow-legged frog proposed by FWS. | FWS | no | $10,000 | $59,781 | $61,500 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 7 | Monitor foothill yellow-legged frog proposed by Forest Service. | Forest Service | yes | $10,000 | $31,820 | $33,500 | no | |
| 8 | Monitor foothill yellow-legged frog on non-Forest Service lands (Butte Creek) – FERC. | Staff | no | $5,000 | $23,942 | $24,800 | yes | |
| 9 | Monitor foothill yellow-legged frog on Forest Service lands (West Branch Feather River) – FERC. | Staff | no | $5,000 | $23,942 | $24,800 | yes | Less monitoring than Forest Service recommenda-tion. |
| 10 | Conduct foothill yellow-legged frog population modeling and population viability analysis proposed by the Forest Service. | Forest Service | yes | $50,000 | $5,785 | $14,300 | no | |
| 11 | Conduct foothill yellow-legged frog population modeling and population viability analysis, and conduct temperature and habitat studies proposed by FWS. | FWS | no | $200,000 | $5,435 | $39,700 | no | |
| 12 | Bald eagle monitoring plan proposed by PG&E. | PG&E, Staff | no | $5,000 | $3,618 | $4,500 | yes | |
| 13 | Bald eagle monitoring plan proposed by the Forest Service and FWS. | Forest Service, FWS | no | $5,000 | $3,600 | $4,500 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 14 | Deer protection at canals. | PG&E, Cal Fish & Game, Staff | no | $0 | $9,600 | $9,600 | yes | |
| 15 | Deer mortality report at the canals. | Cal Fish & Game, Staff | no | $0 | $100 | $100 | yes | |
| 16 | Valley Elderberry Longhorn Beetle Conservation Program. | PG&E, Forest Service, Staff | yes | $0 | $4,800 | $4,800 | yes | |
| **Land Use and Geology Resources** | | | | | | | | |
| 1 | Road Improvements: increased drainage controls (e.g., additional culverts or rolling dips) on several roads to reduce production of fine sediments, replace a number of damaged and/or temporary culverts, install velocity dissipaters at culvert outlets; and improved management of side cast materials during annual road blading activities. | PG&E, Staff | no | $0 | $0 | $0 | yes | |
| 2 | Armor the Round Valley reservoir plunge pool with rip rap and place warning signs to keep visitors away from the steep plunge pool slopes as a means to reduce sediment input to the spillway. | PG&E, Staff | no | $0 | $0 | $0 | yes | |
| 3 | Best management practices: regular aerial and ground patrols, periodic canal repairs and removal of hazard trees, and the abandonment of passively automatic | PG&E, Staff | no | $0 | $0 | $0 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| | siphonic spill equipment. | | | | | | | |
| 4 | Reconstruct and maintain any areas of the Butte Creek canal, slope, and road due to project-related erosion. | BLM, Staff | yes | $15,000 | $200,000 | $202,600 | yes | |
| 5 | Prepare and file a schedule with the Commission that details the reconstruction and maintenance of any areas of the Butte Creek canal, slope, and road that are detrimentally impacted by project activities. | Staff | no | $1,000 | $0 | $200 | yes | |
| 6 | Round Valley dam spillway stabilization plan. | PG&E, Forest Service, Staff | yes | $620,000 | $30,000 | $136,100 | yes | |
| 7 | Philbrook spillway channel stabilization plan. | Forest Service, Staff | yes | $9,506,000 | $60,000 | $1,690,000 | yes | |
| 8 | Prepare and file a schedule with the Commission for filing status reports with the Commission on the ongoing monitoring associated with erosion below the Philbrook spillway channel. | Staff | no | $1,000 | $0 | $200 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 9 | Project canal maintenance and inspection plan. | PG&E, Forest Service, FWS, NMFS, California Fish & Game, Staff | yes | $15,000 | $150,000 | $152,600 | yes | |
| 10 | Project transportation system management plan. | PG&E, Forest Service, FWS, NMFS | yes | $15,000 | $203,000 | $205,600 | no | |
| 11 | Fire management and response plan. | Forest Service, Staff | yes | $0 | $1,000 | $1,000 | yes | |
| 12 | Visual management action plan. | PG&E, Forest Service, Staff | yes | $5,250 | $1,500 | $2,400 | yes | |
| 13 | Sign and information plan. | PG&E, Forest Service, BLM, Staff | yes | $65,000 | $2,300 | $13,400 | yes | |
| 14 | Project transportation system management plan. | PG&E, Forest Service, FWS, NMFS, Staff | yes | $15,000 | $20,300 | $22,900 | yes | |
| 15 | Temporary traffic controls during project construction or operation activities that could be potentially hazardous on all non-federal project lands. | Staff | no | $5,000 | $500 | $1,400 | yes | |
| 16 | Inventory of roads. | Forest Service, FWS, Staff | yes | $10,000 | $0 | $1,700 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 17 | Traffic monitoring plan. | Forest Service | yes | $50,000 | $0 | $8,600 | no | |
| 18 | Maintenance of Portion of Ditch Creek Road. | BLM, Staff | yes | $3,500 | $1,000 | $1,600 | yes | |
| 19 | Pave county road segments. | Butte County | no | $6,265,210 | $0 | $1,072,200 | no | |
| 20 | Replace guardrails on county maintained roads. | Butte County | no | $208,700 | $0 | $35,700 | no | |
| 21 | Pave apron back on Powerhouse Road off Humbug Road. | Butte County | no | $21,850 | $0 | $3,700 | no | |
| **Recreation Resource Measures** | | | | | | | | |
| 1 | Rehabilitation & enhancements at Philbrook reservoir and DeSabla forebay. | PG&E, Forest Service, Staff | yes | $65,000 | $19,200 | $30,300 | yes | |
| 2 | Constructing accessible trails. | PG&E, Forest Service, Staff | yes | $25,000 | $2,500 | $6,800 | yes | |
| 3 | Extend concrete boat launch at Philbrook reservoir. | Forest Service, Staff | yes | $25,000 | $500 | $4,800 | yes | |
| 4 | Construct and maintain public trail at the southeast shoreline of Philbrook reservoir. | Forest Service, Staff | yes | $5,500 | $550 | $1,500 | yes | |
| 5 | Construct accessible restroom at the Fork of Butte Creek Campground. | FWS | no | $30,000 | | $5,100 | no | |
| 6 | Develop a site plan for the Forks of Butte Creek Primitive Campground. | FWS | no | $5,000 | | $900 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 7 | Construct accessible restroom at Ponderosa Bridge Parking area. | FWS | no | $30,000 | | $5,100 | no | |
| 8 | Upgrade/Maintain user-created trail and parking along Toadtown canal. | Forest Service, Staff | yes | $5,000 | $500 | $1,400 | yes | |
| 9 | Complete construction of the Butte Creek Trail on southwest shoreline of Butte Creek to Canyon Bottom. | FWS | no | $5,000 | | $900 | no | |
| 10 | Build a footbridge across Butte Creek to connect the Butte Creek Trail. | FWS | no | $15,000 | | $2,600 | no | |
| 11 | Install kiosk and reconstruct trail alignment at Indian Springs Trailhead. | FWS | no | $2,500 | | $400 | no | |
| 12 | Install vehicle barriers at Willow Dispersed Area. | PG&E, Forest Service, Staff | yes | $1,000 | | $200 | yes | |
| 13 | Visitor management controls (dispersed camping/trash dumping/off highway vehicle). | PG&E, Forest Service, FWS, Conservation Groups, Staff | yes | $5,000 | $1,000 | $1,900 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 14 | Recreation use monitoring, reporting, and future use triggers - The measure entails monitoring change in recreation user patterns, conducting user surveys, creel surveys, monitoring facility, ecological, and social capacity, and initiating an environmental analysis when recreation monitoring of developed recreation facilities indicates any one of the triggers has been attained. | Forest Service, BLM, Staff | yes | $0 | $25,576 | $25,600 | yes | |
| 15 | Stream flow information. | PG&E, Forest Service, BLM, Conservation Groups, Staff | yes | $0 | $2,500 | $2,500 | yes | |
| 16 | Restricted recreation access at DeSabla and Centerville powerhouses. | PG&E, Staff | no | $0 | $3,500 | $3,500 | yes | |
| 17 | Complete recreation access at DeSabla and Centerville powerhouses. | Conservation Groups | no | $0 | $3,500 | $3,500 | no | |
| 18 | Provide 15-20 percent of camping fees at Philbrook Campground. | Forest Service | yes | $0 | $3,000 | $3,000 | no | |
| 19 | Stocking 7,200 pounds of fish in the project. | Cal Fish & Game, Staff | no | $0 | $22,000 | $22,000 | yes | |
| 20 | Stocking 3,311 pounds of fish in project reservoirs and reaches. | PG&E | no | $0 | $10,000 | $10,000 | no | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| 21 | Develop a plan to stock 7,200 pounds of fish in the project in consultation with Cal Fish & Game. | Staff | no | $2,500 | $0 | $400 | yes | |
| 22 | Stock trout at Round Valley reservoir during the spring. | CSSA | no | $0 | $10,000 | $10,000 | no | |
| 23 | Construct and maintain a public day-use area with ADA facilities at Round Valley reservoir. | Cal Salmon and Steelhead Association | no | $50,000 | $2,500 | $11,100 | no | |
| 24 | Half-time law enforcement. | Forest Service, Conservation Groups | yes | $0 | $60,000 | $60,000 | no | |
| 25 | Full-time law enforcement. | Butte County | no | $0 | $107,295 | $107,300 | no | |
| 26 | Funding to address patrol and maintenance. | BLM | yes | $0 | $30,000 | $30,000 | no | |
| 27 | O&M of existing recreation facilities. | PG&E, Forest Service | yes | $25,000 | $25,000 | $29,300 | yes | |
| 28 | File a report describing the effects of the temperature reduction device on the aesthetic value and recreational fishery of the DeSabla forebay. | Staff | no | $3,000 | $0 | $510 | yes | |
| 29 | Develop and implement a plan to monitor the aesthetic value of the DeSabla forebay for 1 year following installation of the | Staff | No | $15,000 | $0 | $2,600 | yes | |

| | Measure | Recommending Entity | Mandatory Section 4(e) Condition? | Capital Cost (2008 $) | Annual Cost (2008 $) | Total Annualized Cost of Measure (2008 $) | Staff Adopted? | Notes: |
|---|---|---|---|---|---|---|---|---|
| | temperature reduction device. | | | | | | | |
| **Cultural Resources** | | | | | | | | |
| 1 | HPMP implementation. | PG&E, Forest Service, Staff | yes | $25,000 | $15,000 | $19,300 | yes | |

## 4.4 NEW PROJECT FACILITIES RECOMMENDED TO BE INCLUDED IN ANY NEW LICENSE

Currently PG&E releases a small amount of water from the DeSabla forebay to the Upper Centerville canal for local water users. Water not diverted by the local water users then drains into Helltown Ravine. As stated in the license application, PG&E has used the Upper Centerville canal and Helltown Ravine as an alternate way to route water to the Centerville powerhouse when the DeSabla powerhouse was out of service. PG&E stated in its August 14, 2008, filing that any unused water that travels down Helltown Ravine is intercepted by the Lower Centerville canal and captured for generation. Therefore, the diversion that conveys water into the Lower Centerville canal from Helltown Ravine, and the portion of Helltown Ravine conveying water from Upper Centerville canal to Lower Centerville canal, should be included within the project boundary as a project facility.

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# 5.0 CONCLUSIONS AND RECOMMENDATIONS

## 5.1 COMPARISON OF ALTERNATIVES

In this section, we compare the developmental and non-developmental effects of PG&E's proposal (the proposed action), PG&E's proposal as modified by staff (staff alternative), the staff alternative with mandatory conditions, and the no-action alternative. We estimate the annual generation of the project under the four alternatives identified above. Our analysis shows that the annual generation would be 146.2 GWh for the proposed action, 148.79 GWh for the staff alternative, 142.47 GWh for the staff alternative with mandatory conditions, and 151.5 GWh for the no-action alternative. We summarize the environmental effects of the different alternatives in table 5-1.

Table 5-1. Comparison of alternatives for the DeSabla-Centerville Hydroelectric Project. (Source: Staff)

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Generation | 155.7 GWh | 146.2 GWh | 148.79 GWh | 142.47 GWh |
| Geology | Continued erosion along roads and at many project facilities such as Round Valley reservoir spillway and Philbrook spillway channel | Implement best management practices to reduce erosion in project area including roads, Round Valley reservoir spillway, and project canals | The proposed action plus the reconstruction of areas of the Butte Creek canal, slope, and road, and development and implementation of a Philbrook spillway channel stabilization plan | Same as staff alternative |
| Aquatic Resources | Provide existing minimum flows, operate project to | Same as no-action with higher minimum instream flows | Higher minimum instream flows in Butte Creek, fish screen and | Same as staff alternative with more extensive resident fish monitoring and |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| | manage water temperatures in lower Butte Creek for federally listed anadromous fish | for resident fish, remove barriers on five feeder diversions, and conduct fish rescues from project canals | ladder at Hendricks diversion dam, monitor resident fish populations and water temperatures in project-affected stream reaches, remove barriers on five feeder diversions, and conduct fish rescues from Butte Creek canals | even higher minimum flows on the West Branch Feather River, Butte Creek and within the feeder creeks |
| Terrestrial Resources | Provide and maintain deer protection facilities (bridges, escape structures, etc.) at project canals | Same as no-action with protection of special status species and invasive species control on Forest Service lands | Provide velocity-based ramping rates to protect egg masses and tadpoles of the foothill yellow legged frog, provide monitoring of foothill yellow-legged frog; extend protection of special status species and invasive species control to non-Forest | Same as staff alternative with more extensive monitoring of foothill yellow-legged frog |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| | | | Service lands; bald eagle monitoring; and summary report of animal mortality and additional protection measures, as appropriate | |
| Threatened and Endangered Species | Operate project to manage water temperatures in lower Butte Creek for federally listed anadromous fish, implement VELB Conservation Program | Higher minimum instream flows for federally listed anadromous fish, reduce project effects on water temperature increases at DeSabla forebay, monitor adult Chinook salmon and steelhead in lower Butte Creek and continue to implement VELB Conservation Program | Same as proposed action with additional monitoring of Chinook salmon movements and habitat responses to changes in minimum instream flows | Same as staff alternative |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| Recreation Resources | Continue to operate and maintain existing recreational facilities at the project | Same as no-action plus rehabilitation and upgrades to existing recreational facilities to ADA standards, work with the Forest Service to discourage dispersed camping and OHV use, install informational signs, fund Cal Fish & Game to stock DeSabla forebay, provide streamflow information and access for whitewater boating | Same as proposed action with additional upgrades to existing boat launch on Philbrook reservoir and existing user-created trail, and recreation monitoring throughout the term of the new license | Same as staff alternative with the addition of a trail on the southeastern shoreline of Philbrook reservoir, a portion of camping fees from Philbrook Campground distributed to Forest Service, and providing project patrol |
| Land Use and Aesthetics | Continue to maintain all project roads and facilities | Work with the Forest Service to identify roads, survey existing road conditions, and maintain all project roads and develop | Same as proposed action with additional erosion control measures and traffic controls during construction | Same as staff alternative with the addition of a 5-year traffic monitoring plan and road maintenance and/or reconstruction |

| Resource | No-action Alternative | Proposed Action | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| | | and implement a visual, fire management, and hazardous substance land management plan | | on several non-project roads |
| Cultural Resources | Previously identified eligible sites protected, but no treatment measures for newly identified sites and no policies for avoidance | HPMP that provides site-specific protection measures and general guidance for protecting cultural sites | Modified HPMP that includes additional information and collection policies | Same as staff alternative |

Under the no-action alternative, environmental conditions would remain the same, and no enhancement of environmental resources would occur.

## 5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the DeSabla-Centerville Hydroelectric Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we select the staff alternative as the preferred alternative. This alternative includes elements of the applicant's proposal, section 4(e) conditions, resource agency recommendations, alternative conditions under EPAct, and some additional measures. We recommend this alternative because: (1) issuance of a new hydropower license by the Commission would allow PG&E to operate the project as an economically beneficial and dependable source of electrical energy for its customers; (2) the 26.7 MW of electric energy generated may offset the use of a fossil-fueled, steam-electric generating plant, thereby conserving nonrenewable resources and reducing atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) recommended environmental protection measures, including minimum instream flows and ramping rates, erosion control measures, protection and monitoring of federally listed species (including VELB, Chinook salmon, and steelhead trout), provisions to enhance recreational facilities, the implementation of an HPMP, and various measures for the protection of terrestrial resources, would enhance the environmental resources at the project.

Finally, for the reasons outlined below, we recommend that certain section 4(e) conditions specified by the Forest Service and BLM not be included in the staff alternative. The conditions we are not recommending include: (1) Forest Service condition 19 to monitor trout populations above and below the Hendricks diversion dam; (2) Forest Service condition 32 for the resolution of PG&E encumbrances; and (3) BLM's condition 19 to fund law enforcement patrols within the project's area.

Additionally, for those Forest Service conditions we do recommend, we recommend many of them with modification. These include: condition 18 for minimum instream flows; condition 20 for monitoring of resident trout, benthic macroinvertebrates, water temperature, and amphibians within project-affected stream reaches; and condition 33 for recreational facilities on or affecting National Forest System lands. We note, however, on June 11, 2009, the Forest Service filed a letter with the Commission in response to our revised preliminary recommendation issued on May 22, 2009, and discussed in section 5.4.1. In its letter, and during the June 29, 2009, section 10(j) meeting, the Forest Service identified several 4(e) conditions that it would modify or withdraw to allow consistency between its modified 4(e) conditions and the 10(j) recommendations resolved between Commission staff and the 10(j) agencies. We identify these 4(e) conditions in section 5.4.2, table 5-3. In the following section, we discuss in detail our recommended modifications to the mandatory conditions and provide our reasoning for these modifications (see also section 5.4, *Summary of Section 10(j) and 4(e) Conditions).*

We do however recognize that the Commission must include these conditions in their entirety, without modification in any license it may issue, because of their mandatory nature.

### 5.2.1 Recommended Alternative

Based on our environmental analysis of PG&E's proposal discussed in section 4 and the costs discussed in section 5, we recommend including the following environmental measures proposed by PG&E in any license issued for the project. Where we make minor modifications to PG&E's proposed measure, we indicate these modifications in *italic* text.

**Geological Resources**

- Increased drainage controls (e.g., additional culverts or rolling dips) on several roads to reduce production of fine sediments, replacing a number of damaged and/or temporary culverts, installing velocity dissipators at culvert outlets; and improved management of side case materials during annual road blading activities to minimize erosion and sediment transport potential during future project operations and management. *File a final report describing the results of these road improvement efforts with Cal Fish & Game, NMFS, the Water Board, FWS, the Forest Service, and the Commission within 30 days of completion of these measures.*

- Develop a project transportation system management plan that includes (1) measures to rehabilitate existing erosion damage and minimize further erosion of the project access roads on National Forest System lands; and (2) installation of gates or other vehicle control measures to achieve erosion protection.

- Armor the Round Valley reservoir plunge pool with rip rap and place warning signs to keep visitors away from the steep plunge pool slopes as a means to reduce sediment input to the spillway. *File a final report describing the results of armoring the Round Valley reservoir plunge pool with Cal Fish & Game, NMFS, the Water Board, FWS, the Forest Service, and the Commission within 30 days of completion of these measures.*

- Continue best management practices such as *annually* performing regular aerial and ground patrols, performing periodic canal repairs and removal of hazard trees, as necessary, and abandoning the use of passively automatic siphonic spill equipment, to reduce the adverse effects of canal failures.

- Develop a Round Valley dam spillway stabilization plan that includes (1) an assessment of areas to be stabilized; (2) feasibility-level design drawings for stabilization measures; and (3) a schedule for implementation of the measures.

- Develop a project canal maintenance and inspection plan that includes (1) annual inspections of the project water conveyance system to identify potential short-term and long-term hazards and to prioritize maintenance and/or mitigation; (2) protocols for routine (non-emergency) canal operations and the use of canal spillways; and (3) stabilization measures to reduce the likelihood of catastrophic canal failure due to hazard trees and geologic hazards and to mitigate sources of chronic erosion and sediment transport into canals.

**Aquatic Resources**

- Develop and implement a canal fish rescue plan for Butte canal and Lower Centerville canal that: (1) defines activities that would trigger canal fish rescue efforts; (2) provides for prior notification and coordination with Cal Fish & Game and NMFS; and (3) identifies methods implemented.

- Maintain a minimum pool in Philbrook reservoir of 250 acre-feet to provide winter habitat for trout.

- After consultation with USGS, install and maintain a flow data logger for measuring stream flow downstream of Hendricks diversion dam on the West Branch Feather River, a real-time flow gaging station upstream of Butte Creek diversion dam, and modify the existing stream gaging station near Lower Centerville diversion dam for real-time data access.

- Complete any needed modifications to the stream flow gaging facilities necessary to measure the new minimum instream flows within 3 years after issuance of any new license.

- Provide notice and an explanation to the Commission as soon as possible, but no later than 10 days after, of any temporary modification to minimum instream flow requirements.

- Make the following stream flow information available to the public via the Internet: West Branch Feather River at USGS gage no. 11405200 (downstream of Hendricks diversion dam), Butte Creek at USGS gage

nos. 11389720 (downstream of Butte Creek diversion dam) and 111389780 (downstream of Lower Centerville diversion dam).

- Monitor water temperature, DO, turbidity, and herbicides (if in use) in receiving streams, upstream and downstream, of canal discharge within 24 hours prior to, during, and within 24 hours of returning project canals to service, and provide a summary of cleaning and maintenance activities as well as the monitoring results to the Water Board, and file a summary report with the Commission within 30 days of completing the monitoring and any associated laboratory analysis.

- Develop, after consultation with the Forest Service, NMFS, FWS, and Cal Fish & Game, and file for, upon Commission approval, a hazardous substances plan.

- Maintain the following minimum instream flows, or inflow, whichever is less (we note those flows with an asterisk that have been modified from PG&E's proposal and are now adopted as part of the staff alternative):

| | **Proposed Minimum Instream Flow (cfs)** | | |
|---|---|---|---|
| **Point of Discharge** | **Normal Water Year** | **Dry Water Year** | **Time Period** |
| Round Valley dam | 0.5 | 0.1 | Year-round |
| Philbrook dam | 2.0 | 2.0 | Year-round |
| Hendricks diversion dam | *15** | *7** | Year-round |
| Butte Creek diversion | 30 | 20 | March 1 to May 31 |
| dam | 16 | *10** | June 1 to Feb. 28 |
| Lower Centerville | 75 | 60 | Sept. 15 to Jan. 31 |
| diversion dam | 80 | 75 | Feb. 1 to April 30 |
| | 80 | 65 | May 1 to May 31 |
| | 40 | 40 | June 1 to Sept. 14 |
| Inskip, Kelsey, Little West Fork, and Cunningham Ravine creeks | 0.25 | *0.2** | Year-round |
| Clear and Long Ravine creeks | 0.5 | 0.25 | Year-round |

- In wet water years, after consultation with the Forest Service, *NMFS, FWS, and Cal Fish & Game*, release a minimum instream flow of at least 10 cfs to Philbrook Creek between April 1 through May 15, *provided there is an ample snow pack and there is safe access for PG&E employees*

*to adjust the flow release valve and provide notification to the Commission*.[73]

- If it is determined implementing an increased minimum instream flow of 10 cfs during wet water years may compromise Philbrook reservoir storage, after consultation with the Forest Service, *NMFS, FWS, and Cal Fish & Game*, reduce minimum instream flows to flows no less than 2 cfs *and provide notification to the Commission*.

- Implement minimum instream flow requirements triggered by water year type within 2 business days of the publication of the California Department of Water Resource's Bulletin 120.

- Notify the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and the Commission of drought concerns by March 15 of the second or subsequent dry water year and consult with these agencies by May 15 of the same years to discuss operational plans to manage the drought conditions.

- *Develop, after consultation with the Forest Service, FWS, NMFS, Cal Fish & Game, and the Water Board, and file for Commission approval, a feeder creek diversion facility removal plan* for the removal of feeder diversions on Oro Fino Ravine, Emma Ravine, Coal Claim Ravine, Stevens, and Little Butte creeks.

- Develop, after consultation with the *Forest Service, the Water Board, the Conservation Groups*, NMFS, Cal Fish & Game, and FWS, and file for Commission approval, a DeSabla forebay water temperature improvement plan that addresses the installation of a pipe to convey water from the terminus of Butte canal to the DeSabla forebay intake.[74] *Also, include a provision to monitor water temperatures in Butte Creek and DeSabla forebay for a period of 5 years after measures have been implemented and submit annual reports on these results to FWS, NMFS, the Forest Service, Cal Fish & Game, the Water Board, the Conservation Groups, and the Commission*.

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[73] PG&E did not propose this measure in its license application; however, during the April 13, 2009, section 10(j) meeting, PG&E agreed to implement this measure.

[74] In its license application, PG&E proposed to construct a baffle wall facility to reduce thermal loading within the forebay; however, during the April 13, 2009, section 10(j) meeting, PG&E agreed to construct a pipe to reduce thermal loading.

- Develop, after consultation with *the Forest Service, the Water Board*, NMFS, Cal Fish & Game, and FWS, and file for Commission approval, a long-term operations plan that includes the development of an annual Project Operations and Maintenance Plan.

**Terrestrial Resources**

- Annually review current list of special-status species.

- Inspect wildlife bridges and deer escape facilities and replace as necessary.

- Monitor animal losses in project canals.

- Implement a vegetation management plan.

- Implement an invasive weed management plan.

**Threatened and Endangered Species**

- Continue to implement the VELB Conservation Program.

**Recreational Resources**

- Develop and implement a recreational facility rehabilitation and ADA upgrade plan for capital and rehabilitation improvements to the existing recreational facilities at Philbrook reservoir and DeSabla forebay recreation areas.

- Provide streamflow information on project reaches for recreational boating.

- Provide restricted stream access at DeSabla and Centerville powerhouses.

- Develop and implement an operation and maintenance plan for developed recreational facilities at Philbrook reservoir and DeSabla forebay recreational areas.

- Develop and implement a sign and information plan to determine the type of signs, number, and locations of where the signs will be placed at the project.

- Develop and implement a recreation operation plan for the annual operation and maintenance of the existing recreational facilities at Philbrook reservoir and the DeSabla forebay recreation areas.

**Land Use and Aesthetic Resources**

- Develop a visual management plan to include painting, revegetating, screening, and repairing facilities as well as disposing of debris piles.

- Develop a project transportation system management plan for the protection and maintenance of roads associated with the project.

**Cultural Resources**

- *Within 60 days of license issuance,* implement the February 2008 HPMP *with the following revisions: 1) update the February 2008 HPMP with the additional historic context information provided by BLM, the Forest Service, and the Mechoopda Tribe; 2) develop a collection policy for discovery, curation, and disposition of artifacts*, *noting that all artifacts from National Forest System lands remain the property of the Forest Service; 3) develop a detailed HPMP section addressing identification, restoration, accessibility, and stewardship collaborations for traditional plant gathering/tending in wetlands and riparian habitat communities culturally important to participating Tribes; 4) identify specific management measures to be undertaken and include them within PG&E's best practices or procedural manuals; and 5) include mitigation measures for the Round Valley reservoir site CA BUT 1225/H, the Philbrook Lake Tenders Cabin, and other sites as determined necessary during consultation with applicable agencies and participating Tribes.*

In addition to PG&E's proposed measures listed above (and modified as indicated), we recommend the following measures:

**Geological Resources**

- Reconstruct and maintain any areas of the Butte Creek canal, slope, and road that are detrimentally affected by project activities. After consultation with BLM and within 1 year of license issuance, PG&E should prepare and file a schedule with the Commission for completing these measures.

- Develop and implement a Philbrook spillway channel stabilization plan to mitigate for the current erosion problem below the Philbrook spillway channel. The plan should also include a schedule for filing status reports

with the Commission on the ongoing monitoring associated with erosion below the Philbrook spillway channel. Implementation of this plan should be complete by December 1, 2010.

- Because of ongoing erosion monitoring, include lands, starting at the Philbrook spillway channel, extending from the two Philbrook spillways and ending at the confluence with Philbrook Creek, in the project boundary.

**Aquatic Resources**

- Promptly resume minimum instream flow requirements after a non-compliance event and notify the Forest Service, FWS, NMFS, Cal Fish & Game, the Water Board, and the Commission within 48 hours of this modification.

- Construct and operate a tap off of the DeSabla forebay temperature reduction device (i.e., pipe) to supply any flows to Upper Centerville canal for local water users.

- Provide a minimum instream flow of 1 cfs, or inflow, during normal water years, and a minimum instream flow of 0.5 cfs, or inflow, during dry water years downstream of the Helltown Ravine diversion dam.

- Provide a minimum instream flow of at least 1 cfs to Philbrook Creek when inflow into Philbrook reservoir is less than 0.5 cfs.

- If sufficient water is not available to hold stream levels constant during periods when foothill yellow-legged frog egg masses are present, ramp flows downstream of Butte Creek diversion dam and Lower Centerville diversion dam such that:

    - During downramping, stage changes should not exceed 0.2 foot per second per hour at foothill yellow-legged frog egg mass sites and water levels should not drop so that more than 20 percent of egg masses are de-watered.

    - During upramping, velocity should not change more than 0.2 foot per second per hour and should not exceed 0.8 foot per second at the most sensitive foothill yellow-legged frog egg mass sites.

    - When foothill yellow-legged frog tadpoles or juveniles are present, the up- and downramping rate should be 0.4 foot per second per hour or less and should not exceed 1.0 foot per second at the site.

- Develop, after consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and file for Commission approval, an instream flow-ramping rate study with the objective of measuring the change in water velocities, stream width, and river stage during up- and downramping of flows in the West Branch Feather River.

- Upon completion of the instream flow ramping rate study, file the study results and final project operation ramping rates with the Commission for approval prior to implementation, along with a description of how any velocity-based ramping rates will be monitored for compliance purposes.

- Develop, after consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and file for Commission approval, a ramping rate plan for flows downstream of the main project diversions in Butte Creek. The plan should include, at a minimum, provisions for determining the relationship between project operations and downstream water velocities, a description of how compliance with the above specified ramping rates will be achieved, and provisions for determining if ramping rates are protecting foothill yellow-legged frog populations.

- Schedule the timing of maintenance or other planned project outages to avoid negative ecological effects on foothill yellow-legged frogs and spring-run Chinook salmon and provide written notice, including proposed measures to minimize the magnitude and duration of spills, at least 90 days prior to such outages, to the Forest Service, FWS, NMFS, Cal Fish & Game, the Water Board, and the Commission.

- Obtain approval from the Forest Service and BLM on the use of pesticides on Forest Service or BLM lands and submit a request for approval of planned uses of pesticides for the upcoming year during annual consultation.

- Utilize only pesticides registered by EPA and do not use them within 500 feet of known locations of California red-legged frogs, mountain yellow-legged frogs, foothill yellow-legged frogs, and Yosemite toads.

- Within 30 days of making the final water year type determination, provide notice of this determination to Cal Fish & Game, FWS, NMFS, the Forest Service, the Water Board, and the Commission.

- If drought conditions are evident, include any potential proposals for modified project operations and file these proposals with the Commission for approval.

- Within 1 year of license issuance, construct, operate, and maintain, after consultation with USGS, a streamflow gage with real-time capability in Philbrook Creek, downstream of the confluence of both the low level release and spill channel in Philbrook Creek.

- Operate and maintain the existing gaging stations on the West Branch Feather River downstream of Round Valley reservoir and the Hendricks diversion dam.

- Measure minimum instream flows as the 24-hour average of the flow (mean daily flow) and as an instantaneous flow, with instantaneous 15-minute stream flow as required by USGS standards at all gages.

- Measure and document all minimum instream flow releases in publicly available and readily accessible formats, and provide these data to USGS in an annual hydrology summary report.

- Within 1 year of license issuance, construct, operate, and maintain, after consultation with USGS, a water temperature and reservoir level gage in Philbrook reservoir with real-time capability.

- Provided there is safe access for PG&E employees to access project facilities at Philbrook reservoir, PG&E should make any necessary adjustments to the minimum instream flow release valve as quickly as possible, or within 2 hours, in response to heat-related events.

- As a result of annual consultation and adaptive management, construct, operate, and maintain up to three additional streamflow gages, upon Commission approval, if needed.

- Weather permitting, provide a roving operator to maintain and monitor the feeder diversions on a weekly basis.

- Develop, after consultation with Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and file for Commission approval, a water temperature monitoring plan, to be incorporated as part of the long-term project operations plan.

- Submit an annual report detailing temperature monitoring results to the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and the Commission prior to annual consultation.

- Include the Water Board and the Forest Service as members of the Operations Group.

- Monitor resident fish populations to evaluate their response to changes in project operations such as minimum flows.

- Monitor benthic macroinvertebrate populations to evaluate their response to changes in project operations such as minimum flows.

- Annually monitor anadromous fish and their designated critical habitats in Butte Creek.

- Develop and implement an adaptive management program to guide the long-term operations of the project to protect the federally listed anadromous fish within Butte Creek that considers the aquatic resources of the West Branch Feather River.

- Develop and implement a fish screen and passage plan for the Hendricks diversion dam that allows for additional flows needed to operate a fish ladder and provide passage to be reallocated to lower Butte Creek to protect listed ESA anadromous fish and designated critical habitat, if deemed appropriate by the Operations Group.

**Terrestrial Resources**

- Monitor foothill yellow-legged frog populations on both the West Fork Feather River and Butte Creek annually for the first 4 years and every 5 years thereafter.

- Expand annual review of special status species to include federally listed species and BLM sensitive/watch list species.

- Provide a summary report of animal mortality every 5 years with recommendations for additional protection measures as needed.

- Extend the vegetation management plan and invasive weed management plan to include non-Forest Service lands within the project boundary where access is available.

- Conduct surveys for bald eagle nesting every 3 years, and prepare a management plan if nesting is detected; increase frequency of surveys if use increases or management activities change.

**Recreational Resources**

- Extend concrete boat launch at Philbrook reservoir.

- Upgrade and maintain user-created trail and parking along Toadtown canal.

- Construct and maintain pathways from three Forest Service public parking areas to the southeast shoreline of Philbrook reservoir.

- Develop and implement a fish stocking plan for project reservoirs and reaches after consultation with Cal Fish & Game.

- Develop recreation use monitoring, reporting, and use triggers to periodically monitor changes in recreation use patterns at the project.

**Land Use and Aesthetic Resources**

- Develop and implement a fire management and response plan to prevent and handle potential fires at the project.

- Develop and implement a plan to monitor the aesthetic value of the DeSabla forebay for 1 year following installation of the temperature reduction device.

- Bring West Branch Feather River road crossing (designated as BW45 road) into the project boundary.

### 5.2.2 Discussion of Measures Recommended by Staff

The following discussion describes the basis for the staff-recommended measures. As a result of the 10(j) process discussed in section 5.4, we modified several of our recommendations made in the draft EA for the protection and monitoring of terrestrial and aquatic resources, including those related to: (1) minimum instream flows to be released from the Butte Creek diversion dam, the feeder creeks, and Hendricks diversion dam; (2) duration and frequency of monitoring benthic macroinvertebrates and resident fish populations; (3) ramping rates; and (4) the installation of a fish screen and ladder at Hendricks diversion dam.

## Geological Resources

*Butte Creek Canal, Slope, and Road*

Consistent with BLM 4(e) condition 21, we recommend that PG&E reconstruct and maintain any areas of the Butte Creek canal, slope, and road that are detrimentally affected by project activities. The measures, specified by BLM, would ensure that any lands affected by the project (damage caused by any spills, blowouts, canal erosion, or seepage onto Ditch Creek Road) will be mitigated for and would be maintained during the course of a new license. After consultation with BLM and within 1 year of license issuance, PG&E should file a schedule for completing these measures with the Commission. We estimate that these mitigations would have an annualized cost of $202,800. We conclude that the benefits of reconstructing and maintaining areas of the Butte Creek canal, slope, and road affected by the project are worth the cost.

*Round Valley Dam Spillway Stabilization*

Continued project operation and management has the potential to result in erosion from the Round Valley dam spillway channel and sediment transport to the West Branch Feather River. Consistent with Forest Service 4(e) condition 21, we recommend that PG&E develop and file, for Commission approval, a Round Valley dam spillway stabilization plan. This plan would ensure the clear identification of the reaches of the channel that are most likely to be future sources of erosion and subsequent sediment transport to the West Branch Feather River and the development of plans for stabilizing such areas of the spillway channel to minimize future erosion and sediment transport. We estimate that the development of a Round Valley dam spillway stabilization plan would have an annualized cost of $136,100. We conclude that the benefits of the development and implementation of such a plan are worth the cost.

*Philbrook Spillway Channel Stabilization*

Erosion at Philbrook spillway is significantly more expansive than that at Round Valley reservoir spillway. Originally, this spillway was included in a reservoir spillway-related erosion and sediment transport survey. However, during an early reconnaissance field trip, a 20-foot-plus hydraulic knickpoint was discovered migrating upstream. As a result, the Forest Service requested that PG&E undertake immediate actions to resolve this issue, prior to the relicensing effort. To date only planning work has been completed. Restoration activities are still at least a year away with the need to complete planning, locate rock borrow sites, and write the environmental analysis for the restoration. Therefore, the Forest Service filed a 4(e) condition that will cover completion of any remaining activities associated with restoration of this spill channel.

Consistent with Forest Service 4(e) condition 22, we recommend that PG&E develop a Philbrook spillway channel stabilization plan. This plan would ensure that

measures are taken to mitigate for the current erosion problem below the Philbrook spillway channel. The plan would also allow for routine monitoring to identify and address any future erosion problems that may arise. In addition, we recommend that PG&E file the Philbrook spillway channel stabilization plan for Commission approval and include the Commission on all correspondence, as well as status reports, related to the erosion problem below the Philbrook spillway channel.

Since the current erosion problem, or knickpoint, is located on lands that are outside the project boundary and the Philbrook spillway channel stabilization plan requires ongoing monitoring for the life of the license, we recommend that these lands, starting at the Philbrook spillway channel, extending from the two Philbrook spillways, and ending at the confluence with Philbrook Creek, be brought into the project boundary. We estimate that the development of a Philbrook spillway channel stabilization plan would have an annualized cost of $1,687,100. We conclude that the benefits of the development and implementation of such a plan are worth the cost.

*Project Canal Maintenance and Inspection*

Consistent with PG&E's proposal and conditions and recommendations filed by the agencies, we recommend that, within 1 year of license issuance, PG&E develop and file for Commission approval, a project canal maintenance and inspection plan. The continued operation of project water conveyances, particularly the Butte Creek and Lower Centerville canals, presents an ongoing risk of adverse environmental impacts on mainstem streams. Continuation of PG&E's best management practices and the development of a project canal maintenance and inspection plan would ensure that hazard trees and geologic hazards, the two primary causes of past failure of project water conveyances at this project, would be identified and, in the most serious cases, mitigated. The plan would formalize existing non-emergency canal operations protocols and provide a consistent point of reference for routine canal operations, while permitting PG&E to operate the project in accordance with its best management practices. The plan also would address a possible range of options (operational and geotechnical) that may be considered to reduce the risk of catastrophic failure due to hazard trees or geologic instability. We estimate that the development of a project canal maintenance and inspection plan would have an annualized cost of $152,600. We conclude that the benefits of the development and implementation of such a plan are worth the cost.

**Aquatic Resources**

*Minimum Instream Flows*

Philbrook Creek – Consistent with PG&E's proposal, Forest Service modified 4(e) condition 18.1, and recommendations from FWS and Cal Fish & Game, we recommend that PG&E release a year-round minimum instream flow of 2 cfs from

Philbrook dam in dry and normal water years to Philbrook Creek. A year-round minimum instream flow of 2 cfs would be consistent with existing license requirements and maintain the existing rainbow trout spawning habitat in both dry and normal water years. We also recommend, consistent with Forest Service modified 4(e) condition 18.1, that when inflow into Philbrook reservoir is less than 0.5 cfs, PG&E discharge a minimum instream flow of at least 1 cfs into Philbrook Creek. We find that implementing these minimum instream flows would be unlikely to compromise reservoir storage and continue to provide habitat for aquatic species in project-affected stream reaches during dry conditions. Further, PG&E's studies indicate that rainbow trout populations in project-affected stream reaches are currently viable and self-sustaining with a minimum instream flow of 2 cfs. Because releases from Philbrook dam can be used for downstream generation, releasing a minimum instream flow of 2 cfs during normal and dry water years to Philbrook Creek would not reduce project generation. Therefore, we conclude there is no cost associated with providing this minimum instream flow. We recommend this minimum instream flow based upon the environmental benefits as further discussed in section 3.3.2.2, *Aquatic Resources*.

Under PG&E's proposal, as discussed at the section 10(j) meetings, Forest Service modified 4(e) condition 18.1, and recommendations from FWS and Cal Fish & Game, minimum instream flows would be increased to 10 cfs between April 1 through May 15 in designated wet years, based upon snow pack levels, in an effort to provide additional stream flow in Philbrook Creek to increase rainbow trout spawning habitat. In the draft EA, we did not support this increase in minimum instream flows during this period because we concluded that current rainbow trout populations in this reach were viable and providing this additional flow may reduce Philbrook reservoir storage, which could affect project operations and the ability to provide cooler water for lower Butte Creek during the summer months.

In the Forest Service's February 26, 2009, comment letter on the draft EA, and during the section 10(j) meetings, additional information was provided regarding this recommended increase in minimum instream flows during wet years, as further discussed in section 3.3.2.2, *Aquatic Resources*. During wet water years, Philbrook reservoir often fills to capacity and spills excess water via the spillways. As a result, implementing this increase in minimum instream flows during wet water years would not compromise cold water storage within the reservoir, would reduce downstream erosion created by spill within the Philbrook spillway channel, and increase the rainbow trout spawning WUA by about 46 percent. Therefore, we recommend that, during designated wet water years, PG&E consult with the Forest Service, FWS, NMFS, and Cal Fish & Game, and release a minimum instream flow of at least 10 cfs to Philbrook Creek between April 1 through May 15, provided ample water is available and PG&E staff can safely access the minimum instream flow release valve at Philbrook dam. We also recommend, consistent with Forest Service modified 4(e) condition 18.1, and recommendations from FWS and Cal Fish & Game, that, if PG&E determines Philbrook

reservoir will not fill to capacity upon implementing this increase in minimum instream flows, it reduce the minimum instream flow to no less than 2 cfs, following consultation with the Forest Service, FWS, NMFS, and Cal Fish & Game. Notification should be provided to the Commission within 24 hours upon increasing minimum instream flows above 2 cfs, and upon reducing flows to no less than 2 cfs. Because this minimum instream flow would utilize spill flows and could be used for downstream generation, we estimate that there is no cost associated with providing this increase in minimum instream flow. We recommend this minimum instream flow based upon the environmental benefits as further discussed in section 3.3.2.2, *Aquatic Resources*.

West Branch Feather River-Downstream of Hendricks Diversion Dam – For reasons discussed in section 5.4, we do not support Forest Service modified 4(e) condition 18.1, or recommendations from FWS and Cal Fish & Game for minimum instream flows downstream of Hendricks diversion dam, as shown in table 3-23.

We recommend that PG&E provide a minimum instream flow of 15 cfs in normal water years and 7 cfs in dry water years downstream of Hendricks diversion dam. Implementing this minimum instream flow would be consistent with current conditions, and in normal years would provide about 41 percent WUA of the adult trout habitat, 62 percent WUA of the juvenile trout habitat, and 58 percent WUA of the spawning trout habitat in the sub-reach above Big Kimshew Creek, as further discussed in section 3.3.2.2, *Aquatic Resources*. As discussed in detail below, and in section 5.4, this recommendation is consistent with the resolved 10(j) recommendations for minimum instream flows, and the fish ladder and screen at Hendricks diversion dam. We estimate implementing our recommended minimum instream flows would not reduce the average annual project generation since implementing these minimum instream flows would be consistent with current project operations. We also note that: (1) implementing PG&E's proposed flows in this reach would reduce the average annual project generation by 2.8 GWh and the annualized net benefit by $243,900; and (2) implementing the agency-recommended flows in this reach would reduce the average annual project generation by an additional 2.6 GWh and the annualized net benefit by an additional $226,000 compared to PG&E's proposal.

Finally, the Forest Service and Cal Fish & Game recommend that flows made available as minimum instream flows downstream from the Hendricks diversion dam should be maintained within the West Branch Feather River downstream along the natural stream course to its discharge at the high-water line of Lake Oroville. The Miocene diversion dam, located about 14 miles downstream of Hendricks diversion dam, is a non-project structure located outside the project boundary. Because this facility is not subject to the terms and conditions of the license, this recommendation is unenforceable and as a result we do not support it.

Upper Butte Creek-Downstream of Butte Creek Diversion Dam – We recommend that PG&E release a minimum instream flow of 30 cfs from March 1 through May 31, and 16 cfs from June 1 through February 28/29 in normal water years, and 20 cfs from March 1 through May 31, and 10 cfs from June 1 through February 28/29 in dry water years. Our recommendation is consistent with recommendations from the Forest Service, FWS, and Cal Fish & Game. Our recommendation differs slightly from the flow regime we recommended in the draft EA, as we now support a 3 cfs increase in minimum instream flows in dry water years from June 1 through February 28/29, as described below.

As further discussed in section, 3.3.2.2, *Aquatic Resources*, our recommendation to increase minimum instream flows from March 1 to May 31 by 14 cfs in normal water years and by 13 cfs in dry water years would further enhance existing habitat conditions for rainbow trout, providing an additional 21 percent WUA for trout spawning habitat in normal water years and 60 percent in dry water years.

In the draft EA, we did not support recommendations from the Forest Service, FWS, and Cal Fish & Game to increase minimum instream flows in this reach by 3 cfs in dry water years from June 1 to February 28/29 to 10 cfs. At that time, we concluded that, although this recommendation would further increase rainbow trout habitat in this reach compared to our recommendation and existing conditions (7 cfs), it would have a minimal effect on reducing downstream water temperatures for rainbow trout. Compared to our recommended minimum instream flow of 7 cfs in dry water years from June 1 through February 28/29, we estimated that implementing the increased agency dry year recommended minimum instream flow (10 cfs) in upper Butte Creek over the same time period would reduce the average annual project generation by 0.353 GWh and the annualized net benefit by $31,000. Therefore, we concluded that the environmental benefits of providing this increase in minimum instream flows did not justify this cost.

However, on May 15, 2009, PG&E filed additional information indicating that the agency-recommended increase in minimum instream flows downstream of Butte Creek diversion dam would only reduce the annual project generation by 0.1 GWh and reduce the average annualized net benefit by $8,700, not the $31,000 estimated by Commission staff in the draft EA. As further discussed in section 5.4, based on the updated costs provided by PG&E, we now recommend that PG&E provide the agency-recommended minimum instream flow of 10 cfs in dry water years between June 1 and February 28/29. We now conclude that the environmental benefits of increased habitat during dry years described above justify these minimal annualized costs.

Lower Butte Creek-Downstream of Lower Centerville Diversion Dam – As discussed in section 3.3.2.2, *Aquatic Resources*, water at the Lower Centerville diversion dam can be either discharged downstream into lower Butte Creek as minimum

instream flows, or diverted into the Lower Centerville canal, which flows to Centerville powerhouse, and discharged back into lower Butte Creek, 6.4 miles downstream of the dam. The project operates such that cooler water is diverted from the West Branch Feather River Basin into lower Butte Creek, which creates a net benefit to spring-run Chinook salmon by decreasing instream water temperatures in the summer months. About 40 percent of the flow in lower Butte Creek in July through August results from flows diverted from the West Branch Feather River. If not for current project operations providing this cold water benefit, natural water temperatures within lower Butte Creek would likely exceed those needed to support the number of salmon which now return to Butte Creek. Project operations have resulted in returns in excess of historical numbers and have therefore resulted in a lack of suitable spawning habitat. However, we recognize that increasing minimum instream flows downstream of the Lower Centerville diversion from mid-September through February would likely provide additional spawning habitat for these salmon. As a result, in the draft EA, we recommended PG&E's proposed minimum instream flows for lower Butte Creek, because they would increase minimum instream flows compared to current conditions (see table 3-27).

During the section 10(j) meetings, the resource agencies stated their primary concern was the lack of available spawning habitat for spring-run Chinook salmon downstream of Lower Centerville diversion dam, which the agencies stated could be increased further under their recommended flows (see table 3-27). The agencies state that their recommended minimum instream flows would alleviate redd superimposition and pre-emergent fry mortality more than would occur under PG&E's proposed and our recommended minimum instream flows. Lastly, the agencies stated that releasing their recommended flows from Lower Centerville diversion dam would provide more spawning habitat both upstream and downstream of Centerville powerhouse, allowing salmonids to spread out and better utilize the habitat.

To increase the amount of spawning habitat in lower Butte Creek, we recommend that PG&E release the minimum instream flows specified in table 3-27 (in bold) from Lower Centerville diversion dam, consistent with our recommendations in the draft EA. We conclude that implementing our recommended flows would provide additional spawning habitat for ESA-listed spring-run Chinook salmon below Lower Centerville diversion dam, help to alleviate the agencies' concerns regarding redd-superimposition in this reach, and also provide additional spawning habitat for ESA-listed steelhead, as further discussed in section 3.3.2.2, *Aquatic Resources*. We estimate that providing our recommended minimum instream flows for Lower Centerville diversion dam would reduce the average annual project generation by 2.4 GWh and the annualized net benefit by $209,100. We conclude that the environmental benefits and protection of spring-run Chinook salmon associated with these minimum instream flows justify this annualized cost.

We do not support recommendations from the Forest Service, FWS, NMFS, and Cal Fish & Game to increase minimum instream flows in this reach to 100 cfs during normal water years, and 75 cfs during dry water years. Overall, the agency-recommended minimum instream flows would provide only an additional 6 to 10 percent WUA for spring-run Chinook salmon spawning habitat in the middle Butte Creek sub-reach, and an additional 8 to 12 percent WUA for salmon spawning habitat in the lower Butte sub-reach compared to PG&E's proposed and our recommended minimum instream flows. We estimate that providing the agency-recommended minimum instream flows for Lower Centerville diversion dam would reduce the average annual project generation by an additional 2.0 GWh and the annualized net benefit by an additional $174,000, compared to PG&E's proposed and staff recommended minimum instream flows, as described above. We conclude that the minor additional increase in spring-run Chinook salmon spawning habitat does not justify these additional costs.

Inskip, Clear, Kelsey, Long Ravine, Cunningham, and Little West Fork Creeks – In the draft EA, we supported PG&E's proposal to release minimum instream flows downstream of these diversion dams consistent with existing license requirements, as shown in table 3-3. We concluded that current trout populations both above and below these feeder creek diversion dams were self-sustaining and that the existing minimum instream flows provided good water quality conditions to support resident aquatic organisms. However, during the April 13, 2009, section 10(j) meeting, the Forest Service stated its required/recommended minimum instream flows for the feeder creeks were based not solely on resident fish species, but also on the requirements of foothill yellow-legged frogs, which utilize these creeks as over-wintering areas. The Forest Service stated that, based on some basic estimates of wetted-perimeter, minimum instream flows proposed by PG&E were insufficient and that minimum instream flows of 0.1 cfs, as we recommended in the draft EA for Inskip, Kelsey, Cunningham Ravine, and Little West Fork creeks, during dry water years have been observed to dry up, causing the bypassed reaches to go dry.

Forest Service modified 4(e) condition 18.1 requires PG&E to install three pipes in Hendricks/Toadtown canal to supply a range of minimum instream flows (0.75 to 0.2 cfs) to be released downstream of the diversion dams on Cunningham Ravine, Long Ravine, and Little West Fork creeks, depending upon the quantity of water present in the canal.[75] For Inskip, Kelsey, and Clear creeks, the Forest Service and FWS recommended flows would be 1 cfs in normal water years and 0.5 cfs in dry water

[75] During the April 13, 2009, section 10(j) meeting, the resource agencies stated they would defer to the Forest Service's conditions for minimum instream flows in the feeder creeks under their jurisdiction, including Little West Fork, Cunningham, and Lone Ravine creeks.

years. Overall, these flows specified by the Forest Service in modified 4(e) condition 18.1 and recommended by FWS, and Cal Fish & Game are greater than those proposed by PG&E and recommended in the draft EA. Further, the Forest Service states that its specified minimum instream flows would provide additional habitat for aquatic organisms in the bypassed reaches of each respective feeder creek. We estimate that implementing the Forest Service's specified and Cal Fish &Game's recommended minimum instream flows in Long Ravine, Cunningham Ravine, and Little West Fork creeks would reduce average annual project generation by 0.92 GWh and the annualized net benefit by approximately $80,000. We also estimate the Forest Service and FWS' recommended flows for Inskip, Kelsey, and Clear creeks would reduce average annual project generation by 3.06 GWh and the annualized net benefit by approximately $266,000. We conclude that the minor additional benefits these flows would provide do not justify these additional costs. Additionally, as noted in section 5.4 and as a result of the 10(j) process, FWS withdrew its recommendation for these flows.[76]

We continue to conclude that the minimum instream flows proposed by PG&E, as shown in table 3-3, would provide adequate habitat for aquatic organisms in normal water years, as no information has been provided to indicate otherwise. However, because the Forest Service provided information that indicates minimum instream flows of 0.1 cfs dry up downstream of the diversion dam, we now recommend PG&E provide minimum instream flows of 0.2 cfs in dry water years downstream of the feeder diversion dams on Inskip, Kelsey, Cunningham Ravine, and Little West Fork creeks. These minimum instream flows would be consistent with those specified by the Forest Service in dry water years under modified 4(e) condition 18.1. In summary, we recommend the following minimum instream flows be released downstream of the feeder diversion dams: 0.25 cfs (normal water years) and 0.2 cfs (dry water years) for Inskip, Kelsey, Cunningham Ravine, and Little West Fork creeks, and 0.5 cfs (normal water years) and 0.25 (dry water years) for Clear and Long Ravine creeks. We estimate that these recommended minimum instream flows would not reduce average annual project generation or the annual net benefit since they are consistent with existing conditions, except for a 0.1 cfs increase in dry water years, which we conclude would be an insignificant cost with no reduction on the annual net benefit.

Helltown Ravine – Although Upper Centerville canal has not been used for project operations for many years, PG&E discharges approximately 3 cfs into this canal for local water users. As discussed in section 3.3.2.2, *Aquatic Resources*, any unused water from Upper Centerville canal travels down Helltown Ravine until it is intercepted by the Helltown diversion dam and flows into Lower Centerville canal where it is picked up for generation at Centerville powerhouse. As a result, the bypassed reach

[76] See personal communication from D. Giglio, FWS, to K. Hogan, FERC, filed on July 14, 2009.

downstream of the diversion dam may go dry, reducing aquatic habitat for resident trout, foothill yellow-legged frogs, and other aquatic organisms. Therefore, we recommend, consistent with recommendations from the Forest Service and FWS, that PG&E release a minimum instream flow of 1 cfs, or inflow, during normal water years, and a minimum instream flow of 0.5 cfs, or inflow, during dry water years. Implementing this minimum instream flow would likely provide additional habitat for resident aquatic organisms compared to existing conditions when all flow in Helltown Ravine can potentially be diverted into Lower Centerville canal. We estimate that providing this minimum instream flow to Helltown Ravine would reduce the average annual project generation by 0.11 GWh and that the total annualized cost of implementing this minimum instream flow would be $9,600. We conclude that the environmental benefits justify this cost.

The Conservation Groups recommend that PG&E provide a minimum bypass flow of 1 cfs in Helltown Ravine downstream of the diversion dam. Although we support the Conservation Groups recommended minimum instream flow of 1 cfs during normal water years, as discussed above, we do not recommend providing a minimum instream flow of 1 cfs during dry water years. It is likely the Conservation Groups' recommended minimum instream flow during dry water years would provide an unknown amount of additional habitat for aquatic resources in this reach, compared to our recommendation. We estimate that the cost of providing this increased minimum instream flow to Helltown Ravine would reduce the average annual project generation by 0.22 GWh and that the total annualized cost of implementing this minimum instream flow would be $19,200, or about $9,600 more than implementing our recommended minimum instream flow. However, we conclude that providing our recommended minimum instream flow of 1 cfs in normal water years and 0.5 cfs in dry water years would protect aquatic resources in Helltown Ravine and that the unknown additional benefits that would be provided by increased minimum instream flows to 1 cfs in dry water years do not justify the increased costs.

As discussed in the *DeSabla Forebay Water Temperature Improvement Plan* section, we recommend that PG&E construct and operate a pipe to transport water from Butte canal to the DeSabla forebay intake to reduce thermal loading within the forebay. As further discussed in section 3.3.2.2, *Aquatic Resources*, as a result of implementing this measure, water temperatures within the forebay would likely be increased compared to current conditions, potentially resulting in increased water temperatures within Upper Centerville canal, and in Helltown Ravine and lower Butte Creek, as these flows travel downstream through the project. Therefore, PG&E should provide flows to Upper Centerville canal via a tap off of the pipe transporting water from Butte canal to the DeSabla powerhouse intake to ensure flows are as cold as possible for the benefit of downstream aquatic species. We consider the costs of constructing and operating this tap to be included within our cost estimates for developing and implementing a DeSabla

forebay temperature improvement plan and that the environmental benefits of providing these flows via a tap justify the costs.

*Removal of Feeder Diversion Dams*

PG&E proposes, and Cal Fish & Game, FWS, and the Forest Service support, the removal of five feeder diversions because their use has been discontinued for more than 10 years and they no longer serve a project purpose. These feeder diversions include Oro Fino Ravine, Emma Ravine, and Coal Claim Ravine feeders on Lower Centerville canal; Stevens Creek feeder on Butte canal; and Little Butte Creek feeder on the Hendricks canal. Although no specific fish surveys were conducted in these feeder tributaries, PG&E surveyed the habitat as part of Study 6.3.3-11, Canal Feeder Stream Study Plan. As a result of the habitat surveys conducted, we conclude that each of these tributaries is likely to support fish populations above and below the diversion structures and that removing the five feeder diversions as proposed would reestablish the habitat connectivity within the tributary streams. Therefore, consistent with recommendations from the Forest Service and FWS, we recommend that PG&E file a feeder creek diversion facility removal plan that provides a schedule for the removal of the diversions and detailed measures necessary for the protection of environmental resources that would be implemented during their removal. We further recommend, consistent with recommendations from the Forest Service and FWS, that PG&E develop the plan after consultation with the Forest Service, FWS, NMFS, Cal Fish & Game, and the Water Board. Additionally, this plan should be submitted to the Commission for approval. Because these facilities are no longer used and would provide environmental benefits upon removal, we conclude that developing and implementing this plan is warranted and justifies the estimated annualized cost of $13,700.

As described in section 3.3.2.2, *Aquatic Resources*, the Forest Service and FWS recommend minimum instream flows downstream of the Little Butte Creek diversion dam and therefore are not recommending this diversion be included in their recommended feeder creek diversion facility removal plan. Because this diversion dam, like the others discussed above, has not been in use for many years, PG&E is proposing that it be removed. Therefore, we recommend that the Little Butte Creek diversion dam also be included in the feeder creek diversion facility removal plan.

*Lower Centerville Diversion Dam Removal*

Removal of the Lower Centerville diversion dam, which may be a result of the Conservation Groups and CSSA's recommendations, would essentially decommission the Centerville development and eliminate the need for PG&E's proposed project canal fish rescue plan or a fish screen at the entrance to the Lower Centerville canal. Removing this structure would open up a small amount of fish habitat below a large 35-foot-high natural barrier to upstream fish migration, that exists just 0.58 mile upstream

of the diversion dam. However, it would also prevent the delivery of cold water to lower Butte Creek below the Centerville powerhouse, as discussed above and in section 3.3.2, *Aquatic Resources*.

As discussed above, if all the flow from DeSabla powerhouse remained in the channel, as would occur if the Lower Centerville diversion dam were to be removed or the Centerville powerhouse were decommissioned, the mean temperatures in the stream reach between the diversion dam and the Centerville powerhouse would be cooler. However, water temperatures in the stream reach downstream of the Centerville powerhouse would increase by 0.67 ºC in a normal year and 1ºC in a dry year. We recognize that this increase in temperature would be mitigated by our recommended DeSabla forebay water temperature improvement facility, discussed below. Regardless, the water below Centerville powerhouse would be warmer than the water in the stream reach between the Lower Centerville diversion and the Centerville powerhouse. As a result, it is likely that fish would move upstream above Centerville powerhouse in search of the colder water, exacerbating the already crowded conditions.[77] As a result, the limited environmental benefit of decommissioning of the Centerville development does not justify the annualized cost of $136,900.

*Ramping Rates*

Consistent with Forest Service modified 4(e) condition 18.5, we recommend that PG&E implement the instream flow-ramping rate study as described in section 3.3.2.2, *Aquatic Resources*. Also consistent with Forest Service modified 4(e) condition 18.5, we recommend that PG&E consult with the Forest Service, Water Board, FWS, NMFS, and Cal Fish & Game upon the completion of the study to review data and develop appropriate ramping rates based on this information. We conclude that implementing this study would result in the collection of site-specific information which would be used to establish ramping rates that would protect salmonids and foothill yellow-legged frogs present in the West Branch Feather River. Upon determining appropriate ramping rates for this reach, the recommended ramping rates should be filed with the Commission for approval prior to implementation, along with a description of how any velocity-based ramping rates will be monitored for compliance purposes. We estimate that implementing this study would have an annualized cost of about $12,800, and conclude that the environmental benefits of implementing this study justify this cost.

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[77] Cal Fish & Game studies conducted between 2001 and 2007 found that the population of adult spring-run Chinook salmon in the Upper Centerville reach exceeded the available spawning habitat, while during this same period, spawning habitat downstream of Centerville powerhouse was underutilized (PG&E's reply comments filed with the Commission on August 18, 2008).

We also support recommendations from FWS that, if sufficient water is not available to hold stream stage levels constant during periods when foothill yellow-legged frog egg masses are present downstream of Butte Creek diversion dam and Lower Centerville diversion dam: (1) downramping at egg mass sites should occur at no greater than 0.2 foot per second per hour with water levels dropping to the extent that not more than 20 percent of egg masses are de-watered: (2) upramping should occur so that velocity would not change more than 0.2 foot per second per hour and would not exceed 0.8 foot per second at the most sensitive egg mass site (consistent with NMFS' recommendation); and (3) up- and downramping should occur no more than 0.4 foot per second per hour and no more than 1.0 foot per second at the site when tadpoles or juveniles are present. We also support recommendations from NMFS and FWS that, if foothill yellow-legged frog monitoring, as discussed below, identifies the need for modifications to the ramping rate criteria specified above; PG&E should consult with the Forest Service and the resource agencies to establish more appropriate ramping rates. Any such modifications should be filed with the Commission for approval.

We also support PG&E's proposal to schedule canal outages as early in the year as possible to avoid the foothill yellow-legged frog breeding and rearing season, and to avoid changes in releases at the diversion during critical times in the life history of foothill yellow-legged frogs. Scheduling canal outages would be determined through the development of the fish canal rescue plan. This would reduce the potential displacement of egg masses, tadpoles, and adults to unsuitable habitat. However, we further recommend that these measures also be applied to the Butte and the Lower Centerville canals to protect foothill yellow-legged frogs and aquatic resources downstream of these diversion dams in Butte Creek. PG&E should provide written notice, including proposed measures to minimize the magnitude and duration of spills, at least 90 days prior to such outages, to the Forest Service, FWS, NMFS, Cal Fish & Game, the Water Board, and the Commission.

Controlling the rate of flow and stage changes during critical time periods would limit the potential for mortality of early life stages of foothill yellow-legged frogs and other aquatic species present in the bypassed reaches. As discussed in section 3.3.2, *Aquatic Resources*, we conclude that the Forest Service specified and NMFS and FWS recommended ramping rates would be more protective of foothill yellow-legged frog populations than current conditions and would allow for more of an adaptive management approach. This approach would allow for refining ramping rates, if needed, to better protect foothill yellow-legged frog populations and other aquatic organisms present in project-affected stream reaches. We further recommend that PG&E develop after consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and file for Commission approval, a ramping rate plan. This plan should address methodologies for determining the relationship between project operations at the diversion dams (Butte Creek and Lower Centerville diversion dams) in Butte Creek how downstream water velocities at the specified locations are affected, and how

compliance of the previously described ramping rates will be achieved. We estimate the annualized cost of developing this plan to be $10,600, and conclude that the environmental benefits justify this cost.

*Drought Conditions*

Drought conditions in the project area have the potential to put reservoir storage at risk, which in turn could affect project operations and flow releases from Round Valley and Philbrook reservoirs. Therefore, to adequately manage water in these two project reservoirs during drought conditions, we recommend, consistent with Forest Service modified 4(e) condition 18.3, and recommendations from FWS, NMFS, and Cal Fish & Game, that PG&E notify the resource agencies and the Commission of potential drought conditions by March 15 of the second or subsequent dry water year. We further recommend, consistent with Forest Service modified 4(e) condition, and recommendations from FWS, NMFS, and Cal Fish & Game, that upon notification, PG&E consult with these agencies by May 15 to evaluate potential changes to project operations that may be necessary to protect aquatic resources prior to prolonged drought conditions and the onset of extreme summer temperatures. Such consultation would likely involve discussing how best to manage reduced water quantities in the project reservoirs and flow releases from these reservoirs to protect aquatic resources in the project area, including spring-run Chinook salmon in lower Butte Creek. Any proposals for modified project operations would need to be filed with the Commission for approval, prior to implementation. We estimate the total annual cost of this notification and drought consultation would be $500 and conclude that the environmental benefits justify this cost.

*Stream Flow Monitoring*

As discussed in section 3.3.2.1, *Aquatic Resources*, cool water is released from Philbrook reservoir during the high temperature, summer months for the benefit of ESA-listed species in lower Butte Creek. The storage and release of water from Philbrook reservoir is vital to manipulating water temperatures in lower Butte Creek. Non-spill releases are made from the main dam on Philbrook reservoir via a low-level outlet directly to Philbrook Creek. In addition, flows from two spillways at Philbrook reservoir join Philbrook Creek approximately 1,000 feet downstream of the main dam. Currently, PG&E's streamflow gage on Philbrook Creek only measures flow releases from the low-level outlet and does not capture any flow over the spillways. In addition, there is no record of the duration and magnitude of spill events at Philbrook reservoir.

While PG&E does not support the installation of a real-time flow gage in Philbrook Creek downstream of the confluence of both the low-level release and the spill channel, this gage would allow for all flows and river stage in Philbrook Creek to be monitored. Accurately monitoring flows in this reach would better allow for assessing how project operations and flows in Philbrook Creek affect overall water

temperatures in lower Butte Creek and the West Branch Feather River. Therefore, we recommend, consistent with Forest Service modified 4(e) condition 18.4, and recommendations from NMFS and FWS, that PG&E consult with USGS on the installation of a new gaging station that has real-time capability of reading river stage and minimum instream flows, downstream of the confluence of the low-level release and the spill channel in Philbrook Creek. We estimate the total annual cost of constructing, installing, and maintaining this gage in Philbrook Creek would be $17,000 and conclude that the environmental benefits justify this cost.

We also recommend, consistent with Forest Service modified 4(e) condition 18.4, and recommendations from FWS and NMFS, that PG&E, after consultation with USGS, operate and maintain the existing gaging stations on the West Branch Feather River downstream of Round Valley reservoir and the Hendricks diversion dam. Like Philbrook reservoir, water storage and subsequent release from Round Valley reservoir plays an important role in project operations and minimizing the negative effects of high water temperatures on spring-run Chinook salmon in lower Butte Creek. Accurate monitoring of stream flows in the upper West Branch Feather River would better determine how releases from Round Valley reservoir affect overall water temperatures and project operations in both the West Branch Feather River and lower Butte Creek. Also, accurately monitoring flows downstream of the Hendricks diversion dam would allow the Commission to document compliance with any required minimum instream flows in the lower West Branch Feather River. We estimate the total annual cost of operating and maintaining these gages in the West Branch Feather River would be $6,600 and conclude that the environmental benefits justify this cost.

*Additional Streamflow Gages*

In the draft EA, we did not adopt Cal Fish & Game's recommendation that, should additional streamflow gages become necessary over the term of the license, up to three additional streamflow gages may be needed. As discussed in the draft EA, we were unable to analyze this recommendation because Cal Fish & Game did not specify where these gages would be located and did not provide any justification for their necessity. We concluded that the installation, operation, and maintenance of three additional streamflow gages would not justify the costs.

Cal Fish & Game, in its letter filed February 27, 2009, clarified this recommendation. Cal Fish & Game stated that this recommendation was meant to address adaptive management, and that the exact costs or locations of these potential gages are therefore unknown. Cal Fish & Game further stated its main concern was that if it becomes necessary or prudent to have additional streamflow gages to evaluate changes in project operations that may occur, unless the need for these gages is addressed in a license order, the Commission may not require them. However, Cal Fish

& Game stated that, if these gages were incorporated as part of the adaptive management program, this would be an acceptable alternative.

Based on this additional information, we recommend that these three streamflow gages be addressed in the adaptive management program, if needed. If it is determined that these additional streamflow gages are needed to better manage project operations, compliance, and delivery of cold water flows to lower Butte Creek, the construction and operation of each gage must first be approved by the Commission.

*Feeder Creek Stream Flow Monitoring*

Currently, the only project feeder creek that contains a streamflow gage is Long Ravine Creek, which records minimum instream flows along with any spill over the diversion dam. The Forest Service in modified 4(e) condition 18.1 specifies that PG&E install three pipes in the Hendricks/Toadtown canal to deliver a range of minimum instream flows (0.75 to 0.2 cfs) into Long Ravine, Cunningham Ravine and Little West Fork Creek, respectively, downstream of the Hendricks/Toadtown canal. FWS and NMFS recommend that new gaging stations be installed downstream of eight feeder creeks, including Inskip, Kelsey, Clear, Helltown Ravine, Long Ravine, Cunningham Ravine, Little West Fork, and Little Butte creeks. The Forest Service also recommends that new gaging stations be installed downstream of Inskip, Kelsey, Clear, Helltown Ravine, and Little Butte creeks.

Currently, minimum instream flows are made from the project feeder diversions via 3- to 4-inch-in-diameter pipes at the base of the diversion dams with roving operators used to monitor and maintain these diversions on a weekly basis. As discussed in section 3.3.2.1, *Aquatic Resources*, the project feeder creeks are in high gradient areas, which we find can make the installation of stream gages difficult. Further, calibrating stream gages in such environments would also be difficult given the rough channel characteristics and topography, which may result in large amounts of uncertainty, possibly making accurate stream flow estimates unlikely. Additionally, as discussed above, PG&E proposes to remove the diversion dam on Little Butte Creek that has not been in use for many years, thus eliminating the need for a streamflow gage.

The installation of pipes in Hendricks/Toadtown canal, as specified in Forest Service modified 4(e) condition 18.1, would allow for a range of minimum instream flows to be released into the downstream feeder creeks depending upon the quantity of water present in the canal, as previously discussed, and therefore eliminating the need to document compliance. Therefore, we do not recommend the Forest Service, NMFS, and FWS' recommendations, to install stream gaging stations on Inskip, Kelsey, Helltown Ravine, Clear, Long Ravine, Cunningham Ravine, Little West Fork, or Little Butte creeks. We estimate the total annual cost of constructing, installing, and maintaining these eight streamflow gages would be $122,200 and conclude that the

environmental benefits do not justify this cost. In lieu of installing stream gages, we recommend that PG&E continue to utilize roving operators to monitor and maintain these feeder diversions on a weekly basis, provided PG&E employees can safely access the sites. This would ensure any required minimum instream flow releases would continue and that the pipes supplying minimum instream flows do not become blocked with debris. FWS, in its comments on the draft EA, stated utilizing roving operators as recommended by staff in the draft EA is an acceptable alternative to its recommended streamflow gages for the feeder creeks. We estimate the total annual cost of utilizing a roving operator to maintain these facilities would be $20,000 and conclude that the environmental benefits justify this cost.

*Reservoir Levels*

As part of NMFS' recommended long-term operations plan, as further discussed below, NMFS recommends that PG&E install real-time water temperature, reservoir elevation, and flow gages in Round Valley and Philbrook reservoirs. Currently, reservoir elevation data recorded for Round Valley and Philbrook reservoirs is collected at weekly intervals when weather conditions allow access to these reservoirs. As discussed in section 3.3.2.2, *Aquatic Resources*, Round Valley reservoir is completely drained in typically 1 month's time once releases begin from the dam in late-spring to early-summer. Releases from the dam begin as soon as space is available in the Hendricks canal and the low-level gate at Round Valley dam, which supplies these flows, is left fully open until the following spring. Because this reservoir is dry for much of the year and there is little to no project-related reservoir level management once releases begin, we do not recommend installing a real-time water temperature, reservoir elevation, or flow gage within Round Valley reservoir. We estimate that total annual cost of constructing, operating, and maintaining this equipment in Round Valley reservoir would be $17,000 and conclude that the benefits do not justify this cost.

NMFS also recommends that PG&E install real-time water temperature, reservoir elevation, and flow gages in Philbrook reservoir. Water releases and storage within Philbrook reservoir are monitored and adaptively managed to a greater extent by PG&E, than those at Round Valley reservoir. As discussed in section 3.3.2.2, *Aquatic Resources*, flows from Philbrook reservoir are increased and decreased as temperatures in project-affected stream reaches dictate. Monitoring water temperatures within Philbrook reservoir, and reservoir levels on a real-time basis would provide additional data to what are currently collected, and would likely assist in determining any potential modifications to project operations that would further benefit downstream aquatic resources. However, with our recommended real-time streamflow gage in Philbrook Creek, as previously discussed, we conclude an additional flow gage as recommended by NMFS for Philbrook reservoir is unnecessary. Therefore, we recommend that PG&E consult with USGS on the construction, operation, and maintenance of a real-time temperature and reservoir elevation gage within Philbrook reservoir. PG&E should also

consult with the Forest Service, NMFS, FWS, and Cal Fish & Game on the specific locations of these gages. We estimate that total cost of this temperature and reservoir level gage would be $17,000 and conclude that the benefits justify this cost.

As further discussed in section 3.3.2.2, *Aquatic Resources*, and in the draft EA, NMFS recommended that PG&E install remote operating equipment at Round Valley and Philbrook reservoirs. During the section 10(j) meetings, NMFS withdrew this portion of its 10(j) recommendation regarding the installation of remote operating equipment. PG&E clarified that it can make adjustments to the Philbrook reservoir minimum instream flow release valve in approximately 2 hours, provided weather conditions permit access. NMFS stated that this satisfied its concerns, which is the ability to quickly make adjustments to this valve in response to heat events. Therefore, we recommend that provided there is safe access for PG&E employees to access project facilities at Philbrook reservoir, PG&E make any necessary adjustments to the minimum instream flow release valve as quickly as possible, or within 2 hours, in response to heat-related events.

*DeSabla Forebay Water Temperature Improvement Plan*

As discussed in section 3.3.2.2, *Aquatic Resources*, the DeSabla forebay plays an integral role in how water temperatures downstream of DeSabla powerhouse in lower Butte Creek are affected as a result of thermal loading that occurs within the forebay. In the draft EA, Commission staff supported the development of a DeSabla forebay water temperature improvement plan, and further recommended that this plan address reduction of thermal loading within the forebay by 50 percent. In comments submitted on the draft EA, and in clarifications provided at the section 10(j) meetings, FWS, NMFS, and Cal Fish & Game stated they now recommend this plan address the construction of a pipe connecting the terminus of Butte canal to the intake of the DeSabla powerhouse. PG&E also stated at the section 10(j) meetings that it intends to pursue this option, which is consistent with Forest Service modified 10(a) recommendation 5.

Constructing and operating a pipe to transport Butte canal flows to the DeSabla powerhouse intake would be the most efficient option to reduce thermal loading within the forebay, as it would prevent mixing of the colder canal water with warmer water within the forebay. Until the facility is constructed and operating, the exact level of temperature reduction is unknown, although it is likely there would be little to no warming, as discussed at the section 10(j) meetings. However, water temperature monitoring, as described below, would allow for an assessment of the exact level of temperature reduction that would be accomplished through operating this pipe and the effects on lower Butte Creek water temperatures. A pipe would also eliminate the need to require specific reductions in water temperatures (i.e., percent reduction in thermal loading), as recommended by the resource agencies and supported by Commission staff

in the draft EA, since operation of this pipe would be the most effective alternative necessary to accomplish the reductions.

Because water temperatures are critical to the health and survival of aquatic species in lower Butte Creek, including ESA-listed spring-run Chinook salmon and steelhead, we recommend PG&E's proposal to develop and implement a DeSabla forebay water temperature improvement plan, consistent with recommendations from FWS, NMFS, the Forest Service, Cal Fish & Game, and the Conservation Groups. PG&E should consult with the aforementioned agencies and the Water Board in the development of this plan. At a minimum, this plan should include a design of a pipe, as previously described, that will deliver water from the terminus of Butte canal to the DeSabla powerhouse intake, thereby reducing the thermal loading effect that occurs under current project operations. The plan should also include a schedule for final design and construction of the new facility, a description of project operations during construction and when Butte canal or the pipe is out of service, and measures to mitigate any negative impacts on water quality within the forebay during construction. This plan should be submitted to the Commission for approval.

Further, consistent with Cal Fish & Game's recommendation, we recommend that this plan also include a provision for temperature monitoring in lower Butte Creek at the following locations: Butte Creek upstream of DeSabla powerhouse, Butte Creek at Lower Centerville diversion dam, Butte Creek at Pool 4, Butte Creek upstream of Centerville powerhouse, and Butte Creek downstream of Centerville powerhouse, for a period of 5 years, to document the effectiveness of this temperature reduction device on downstream water temperatures. We further recommend that water temperatures within DeSabla forebay be monitored as part of this temperature monitoring. We conclude that monitoring water temperatures within the forebay would document the level of increased water temperatures that would occur as a result operating this pipe and assist in determining which fish species may be viable options for stocking as further discussed below. A report on the results of this temperature monitoring should be submitted on an annual basis to FWS, NMFS, the Forest Service, Cal Fish & Game, the Water Board, the Conservation Groups, and the Commission. We estimate the annual cost of this temperature monitoring is $4,800 and conclude that the environmental benefits justify this cost.

In the draft EA, we underestimated costs for DeSabla forebay temperature reduction devices. PG&E provided additional information at the section 10(j) meetings and in a June 19, 2009, filing, regarding preliminary cost estimates. We find that, based upon this information, developing and implementing a plan that addresses installation of a pipe would have an annualized cost of $918,600. Because the construction and operation of a pipe provide additional environmental benefits (i.e., a further reduction in thermal loading) compared to our recommendation for a baffle wall in the draft EA, and cost estimates are similar, as indicated by PG&E at the section 10(j) meetings, we

conclude that the environmental benefits of developing and implementing this plan justifies this cost.

Alternatively, CSSA recommends PG&E install an 11.76-mile-long pipe from the Hendricks diversion dam to DeSabla powerhouse, replacing the Hendricks and Toadtown canals, to reduce thermal loading and water loss. However, we estimate the cost of installing such a pipe to be about 50 million dollars, with an additional cost between 3 and 5 million dollars to develop an engineering analysis and design plan. As such, we consider this cost to be prohibitive and do not recommend that PG&E develop or implement a plan to replace the Hendricks and Toadtown canals with a pipe.

*Fish Entrainment and Passage*

Relicensing studies found that fish are entrained in project canals as a result of project operations. As a result, to enhance resident fish populations within Butte Creek and the West Branch Feather River, in the draft EA, we recommended increasing minimum instream flow within project bypassed reaches to increase available habitat and provide fish rescues within project canals for entrained fish. We did not recommend providing fish screens at the Lower Centerville or Hendricks diversion dams or a fish ladder at the Hendricks diversion dam. However, as a result of information obtained via the section 10(j) process, discussed below in section 5.4, we no longer recommend increasing minimum instream flows at the Hendricks diversion dam. Alternatively, we now recommend that PG&E develop and implement a fish screen and passage plan for the Hendricks diversion dam and for the enhancement of resident fish populations within the West Branch Feather River. The details of which are discussed below in section 5.4.

As a result of our recommendation for a fish screen and ladder at Hendricks diversion dam, the Forest Service has indicated that it would amend its modified 4(e) for minimum instream flows downstream of Hendricks diversion dam. We estimate the cost of the Forest Service's current specified minimum instream flows to be approximately $470,400 annually. Alternatively, we estimate the cost of providing a fish screen and ladder and developing our recommended fish screen and passage plan to be $339,700. As a result, we find that our recommendation provides for maintaining the current level of electric generation while providing an added enhancement to the resident trout population in the West Branch Feather River. Therefore, we find that the environmental benefits of providing a fish screen and ladder at Hendricks diversion dam, as specified in section 5.4, warrants the annual cost of $339,700.

Subsequently, we do not recommend that PG&E conduct an additional entrainment study within the Hendricks canal, as provided for by the Forest Service's recommendation 21. We estimate the annual cost of conducting this study to be $16,200, and find that with the installation of a fish screen, this study is not necessary. Additionally, the study would not result in any new or pertinent information necessary to inform license measures.

As discussed in section 3, screening the Lower Centerville diversion dam may prevent the entrainment of juvenile rainbow trout that may be migrating seaward. However, we find this to be speculative. Based on historical references in the Pre-Application Document the Lower Centerville diversion dam is assumed to be the upstream-most point of anadromy on Butte Creek. Therefore, absent scientific information demonstrating the presence of Central Valley steelhead upstream of the Lower Centerville diversion dam and given our finding that the resident trout populations in upper Butte Creek are generally healthy and viable, we do not recommend the installation of a fish screen at the Lower Centerville diversion. We do however, recommend, as discussed above and in section 5.4, that PG&E increase the minimum instream flows provided from the Butte Head and Lower Centerville diversion dams. Additionally, we recommend that PG&E conduct annual fish rescues from the Lower Centerville and Butte Creek canals.

We estimate that providing fish screens at Lower Centerville diversion and Butte Creek dams, as recommended by the parties identified in table 3-28**,** would have an annualized cost of $738,600. Although providing these fish screens will largely prevent Butte Creek fish from becoming entrained into the project's canal system and project intakes, and reduce the project's effects on resident trout populations, as discussed in section 3.3.2, *Aquatic Resources*, we find that resident trout populations within project-affected stream reaches are generally healthy and viable. Alternatively, our recommended instream flows for Butte Creek and the annual canal fish rescues would cost about $223,900 annually and provide additional habitat enhancements for the ESA-listed fish species in lower Butte Creek. As such, we find that the environmental benefits of providing fish screens at the Lower Centerville diversion and Butte Creek dams do not justify the cost.

*Resident Fish and Benthic Macroinvertebrate Monitoring*

For reasons discussed in section 5.4, we do not support the Forest Service's condition 19 or PG&E's alternative condition to conduct trout population monitoring in the vicinity of the Hendricks diversion dam.

However, we recognize that aquatic species composition and relative abundance should respond to our recommended habitat enhancements, such as increased minimum instream flows, and measures like the Hendricks diversion dam fish screen and ladder, and the DeSabla Forebay Water Temperature Improvement facility and that monitoring

that response is appropriate. We recommend that PG&E monitor resident fish populations within Butte Creek and the West Branch Feather River, at three locations in each, beginning the third year after license issuance and every 5 years thereafter for the term of the license, as discussed in section 5.4. This monitoring effort would help to determine the resident fish and benthic macroinvertebrate populations' response to changes in project operations as discussed in section 3.3.2, *Aquatic Resources*, and would inform the adaptive management decision-making process. As discussed in section 5.4, this recommendation is consistent with the resolved 10(j) recommendations for resident fish and benthic macroinvertebrate monitoring. Additionally, the Forest Service has indicated that it will revise its modified 4(e) conditions (as they apply to the West Branch Feather River) to be consistent with this recommendation. We estimate the annualized cost of our recommended resident fish and macroinvertebrate monitoring, for both the West Branch Feather River and Butte Creek, to be $37,000 and that the environmental benefits warrant the cost. We also note the Forest Service's modified 4(e) conditions[78] for fish and benthic macroinvertebrate monitoring for the West Branch Feather River alone is estimated to cost $45,900 annually.

*Anadromous Fish Monitoring*

We find that developing and implementing a plan to annually monitor federally listed anadromous Chinook salmon and steelhead trout and their habitats in Butte Creek as recommended by NMFS and FWS in their 10(j) recommendation 5(A) and 6(A) respectively, the Forest Service in its 10(a) recommendation 6(A), and Cal Fish & Game, and proposed by PG&E is warranted. Monitoring efforts would include annual snorkel surveys to monitor adult distribution and abundance, pre-spawn mortality surveys, and carcass surveys. The plan would also provide for the consideration of juvenile emergence and outmigration monitoring in extreme dry years. The plan would also consider modifications to facility operations and maintenance necessary to avoid, minimize, or improve project-related effects on Chinook salmon and steelhead and would be used to inform the decision-making processes to be included in the long-term operations plan discussed below. Implementation of this annual monitoring at an estimated annual cost of $139,700 would provide information to identify any changes in project structures or operations necessary for continued protection of federally listed Chinook salmon and steelhead. Given the federally listed status of these species, we find that the environmental benefits of this measure warrant the cost.

Cal Fish & Game's 10(j) recommendation 6 would also include annual monitoring of movement patterns of adult Chinook salmon in response to any flow changes, and the monitoring of Chinook salmon holding habitat and spawning gravels. PG&E does not commit to monitoring these additional measures, stating that it needs

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[78] Forest Service modified 4(e) conditions 19 and 20.

further clarification on these monitoring recommendations. We find that monitoring the response of adult Chinook salmon and steelhead, and their habitats as a result of a change in project operation is prudent. Alteration in project flows may change the value and/or location of holding and spawning habitats and tracking these changes is warranted. However, we do not find that this monitoring needs to be done on an annual basis. Alternatively, this monitoring should be restricted to the first 2 years following a change in project operations that may influence the anadromous reach of Butte Creek. Two years should provide an adequate time for the habitat to respond, particularly the redistribution of spawning gravels, and to evaluate a change in behavioral patterns of returning adult Chinook salmon and steelhead. Given the federally listed status of these species, we find that the environmental benefits of this measure warrant the estimated annualized cost of $3,400.

The Conservation Groups recommend installation of a removable weir to limit upstream migration of Chinook salmon to enable PG&E's monitoring of Chinook salmon migration, holding, and spawning. The monitoring would then be used to set a default protocol for the weir's installation and removal, for the better management of Chinook salmon habitat and spawning. To address concerns about the effects of the PG&E DeSabla-Centerville Hydroelectric Project on the survival Chinook salmon, Cal Fish & Game constructed a removable fish barrier dam above the Centerville powerhouse to confine all Chinook salmon to the reach below the powerhouse. This action reduced the quantity of holding and spawning habitat for the salmon, but limited their exposure to low flow conditions and high water temperatures. The barrier dam was removed in the 1980s. Since then anadromous fish returns to Butte Creek exceed the historical returns when the barrier dam was in place. As a result, we do not find any reason to install a removable weir or a need to set a protocol for its installation and removal as recommended by the Conservation Groups' 10(a) recommendation 1(c).

*Water Temperature Monitoring*

Water temperatures in the project area are critically important to a variety of aquatic species in project-affected stream reaches. Currently, PG&E operates the project based upon an annual Project Operations and Maintenance Plan that is developed each spring after consultation with the resource agencies. The goal of the plan is to operate the project such that water temperatures are reduced in lower Butte Creek during the hottest periods of the year for the benefit of ESA-listed, spring-run Chinook salmon. Implementing new minimum instream flows in project-affected stream reaches and reducing thermal loading within DeSabla forebay through implementation of the DeSabla forebay water temperature improvement plan, as previously discussed, could separately and cumulatively reduce instream water temperatures in the project area. Because water temperatures throughout the project area would likely be reduced upon implementation of our recommended measures, monitoring water temperatures would better allow for water temperature reductions to

be documented and would provide an understanding of how these new environmental measures and altered project operations would affect instream water temperatures throughout Butte Creek and the West Branch Feather River. Such monitoring could also lead to potential proposed changes in project operations to better manage the available water supply in the project reservoirs for the benefit of aquatic species such as spring-run Chinook salmon in lower Butte Creek. Therefore, we recommend that PG&E develop, after consultation with the Forest Service, Cal Fish & Game, FWS, NMFS, and the Water Board, and implement a water temperature monitoring plan as part of a long-term project operations plan, as discussed below, consistent with Forest Service modified 4(e) condition 20.1 and recommendations by FWS and NMFS.

Consistent with Forest Service modified 4(e) condition 20.1, and recommendations from FWS and NMFS, we recommend that this water temperature monitoring plan provide details for monitoring thalweg water temperature in the project-affected stream reaches and be based on the previous year's annual Project Operations and Maintenance Plan's water temperature monitoring sites, methods, and reporting. We also recommend that the results of this monitoring be submitted to the Forest Service, FWS, NMFS, Cal Fish & Game, the Water Board, and the Commission in a technical report for review prior to the annual consultation meeting. Each annual report should also include a comparison of the temperature results with those of previous years and a discussion of the implications of the water temperature effects of diversion to Butte Creek through the Hendricks canal. The plan should be submitted to the Commission for approval as part of a long-term project operations plan. We estimate the total annual cost of this water temperature monitoring plan would be $29,000 and conclude that the environmental benefits justify the cost.

*Water Quality Monitoring in Receiving Streams*

As discussed in section 3.3.2.2, *Aquatic Resources*, project canal outages can result in short-term turbidity increases in receiving streams downstream of canal discharge. Increases in turbidity within project-affected stream reaches could potentially lead to a variety of negative effects on aquatic organisms, including siltation of spawning and rearing habitat for various aquatic species, including ESA-listed spring-run Chinook salmon, steelhead, and foothill yellow-legged frogs. Additionally, PG&E occasionally utilizes herbicides to control vegetation along project canals, which also has the potential to negatively affect water quality and aquatic resources.

We recommend PG&E's proposal to conduct water quality monitoring in receiving streams prior to, during, and after returning project canals to service. Consistent with PG&E's proposal, this sampling should occur within 24 hours of taking the canal out of service, once in the middle of the canal outage, and within 24 hours of placing the canal back into service, and include water quality sampling in the receiving stream at one site upstream and downstream of the location the canal discharges water

into the stream. Monitoring parameters should include water temperature, DO, and turbidity sampled at regular intervals. We also recommend PG&E's proposal to sample water quality for herbicides in receiving streams in the event they are utilized to control vegetation, following the monitoring methods described above. This water quality monitoring would allow for water quality exceedances of turbidity or herbicides to be identified and for changes in project operations or in the application of herbicides to be considered if necessary to protect aquatic resources. Lastly, we recommend PG&E's proposal to provide a summary of cleaning and maintenance activities and monitoring results to the Water Board, and to file a summary report with the Commission within 30 days of completing the monitoring and any associated laboratory analysis. We estimate the total annualized cost of conducting this water quality monitoring would be $22,000 and conclude that the environmental benefits justify the cost.

In the draft EA, we did not support the Conservation Groups recommendation for PG&E to install turbidity sensors connected to the Internet at four locations on Butte Creek between DeSabla powerhouse and immediately downstream of Centerville powerhouse. In comments received on the draft EA, the Conservation Groups stated that Commission staff misinterpreted the purpose of these sensors and that they would serve as an early warning system for canal failure or other project anomalies. As discussed further in section.3.3.2.2, *Aquatic Resources*, although we recognize these sensors may detect increases in turbidity associated with a canal failure, they would also likely detect other instream increases in turbidity that are not project-related. Therefore, we continue to conclude that installation of these sensors would not initiate a quicker response time than would occur as a result of a canal or powerhouse alarm alerting personnel at the Rock Creek switching center to an outage or failure. However, as previously discussed, we are recommending that PG&E develop and implement a project canal maintenance and inspection plan, which would prevent future canal failures and subsequent increases to instream turbidity levels. We estimate the total annual cost of installing and maintaining these turbidity sensors would be $26,500 and conclude that the environmental benefits do not justify this cost.

*Annual Consultation, Long-term Operations, and Adaptive Management*

Annual Consultation Meeting – The Forest Service's 4(e) condition 1 specifies that PG&E annually meet with the Forest Service to consult on measures needed to ensure protection and utilization of the National Forest resources affected by the project. As specified by the Forest Service, consultation would include but not be limited to:

- a status report regarding implementation of license conditions;
- results of any monitoring studies performed over the previous year in formats agreed to by the Forest Service and PG&E during development of study plans;

- review of any non-routine maintenance;
- discussion of any foreseeable changes to project facilities or features;
- discussion of any necessary revisions or modifications to plans approved as part of this license;
- discussion of needed protection measures for species newly listed as threatened, endangered, or sensitive or, changes to existing management plans that may no longer be warranted due to delisting of species or, to incorporate new knowledge about a species requiring protection; and
- discussion of elements of current year maintenance plans, such as for road maintenance.

PG&E would keep a record of the meeting, which would include any recommendations made by the Forest Service for the protection of National Forest System lands and resources. PG&E would file the meeting record, if requested, with the Commission no later than 60 days following the meeting. A copy of the certified record for the previous water year regarding instream flow, monitoring reports, and other pertinent records would be provided to the Forest Service at least 10 days prior to the meeting date, unless otherwise agreed. Copies of other reports related to project safety and non-compliance would be submitted to the Forest Service concurrently with submittal to the Commission. These would include, but are not limited to, any non-compliance report filed by PG&E, geologic or seismic reports, and structural safety reports for facilities located on or affecting National Forest System lands. Subject to any restrictions contained in any agreement with PG&E, the Forest Service reserves the right, after notice and opportunity for comment, to require changes in the project and its operation through revision of the section 4(e) conditions to accomplish protection and utilization of National Forest System lands and resources.

Long-term Operations Plan – PG&E proposes to develop after consultation with NMFS, Cal Fish & Game, and FWS, and implement upon Commission approval, a long-term operations plan. PG&E proposes the plan would be implemented for the duration of any new license issued with the primary goal of seeking to provide cold water for holding, spawning, and rearing spring-run Chinook salmon and steelhead in Butte Creek upstream and downstream from the Centerville powerhouse. PG&E proposes the plan would consider the feasibility of increasing spawning habitat availability by increasing flows between the Lower Centerville diversion dam and the Centerville powerhouse during the spawning and egg incubation period (late-September to February), while balancing power production. PG&E also proposes the plan would consider modifications to facility operations and maintenance necessary to avoid, minimize, or improve project-related effects on spring-run Chinook salmon.

PG&E's proposed long-term operations plan is consistent with Forest Service 4(e) condition 24, Forest Service 10(a) recommendation 15, Cal Fish & Game 10(j) recommendation 4, FWS 10(j) recommendation 13, and NMFS 10(j) recommendation 8. However, FWS, Cal Fish & Game, and NMFS further recommend that PG&E consult with the Water Board and the Commission and that this plan specify how other project facilities are to operate in both Butte Creek and the West Branch Feather River, how and when water is diverted, and likely times for maintenance activity of project facilities. These agencies further recommend the plan would be filed with the resource agencies. The Forest Service also specifies in 4(e) condition 24 that it also should be included in the consultation when developing this plan.

The Forest Service in 10(a) recommendation 15, FWS in 10(j) recommendation 13, and NMFS in 10(j) recommendation 4 further recommend that the long-term operations plan contain a water temperature monitoring plan that would be developed after consultation with NMFS, FWS, Cal Fish & Game, the Water Board, and the Commission. This plan would be consistent with the water temperature monitoring recommended by these agencies and discussed below in *Water Temperature Monitoring*, and would be based on the previous year's Project Operations and Maintenance Plan's water temperature monitoring sites, methods, and reporting. We discuss agency recommendations pertaining to water temperature monitoring below under *Water Temperature Monitoring*.

NMFS further recommends in its 10(j) recommendation 8 that this long-term operations plan would contain provisions for the installation of remote operating capability as well as the addition of real-time water temperature and reservoir elevation and flow gages in Round Valley and Philbrook reservoirs. NMFS recommends the location of these gages be agreed upon by Cal Fish & Game and NMFS. Because this measure addresses reservoir and stream gages, it is discussed above under *Instream Flow and Reservoir Level Monitoring*.

NMFS further recommends in its 10(j) recommendation 8 that this plan contain: (1) modifications to project facilities and operations necessary to release project flows from various locations from Centerville canal into the diverted reach below Centerville diversion dam; (2) gravel enhancement and pool development to increase physical habitat; and (3) operational alternatives in the event that Centerville powerhouse is shut down during the spawning period.

In addition, during the April 13, 2009, section 10(j) meeting, the agencies and PG&E informed Commission staff that it is their intent that as part of the long-term operations plan, PG&E consult annually with the resource agencies to develop a project operations and maintenance plan for that year, to be filed with the Commission. The annual operations plan would address operations of the project for the protection of the

ESA-listed anadromous fish and the designated critical habitat in lower Butte Creek, taking into consideration each year's available water as well as other parameters.

Comprehensive Monitoring Report – Cal Fish & Game's 10(j) recommendation 5 provides that, during the sixth year of license issuance, PG&E develop, after consultation with the agencies, and submit a comprehensive monitoring and adaptive management summary report. Cal Fish & Game states that PG&E should implement any adaptive management measures specified in the report upon Commission approval.

Conducting an annual meeting to review the results of monitoring reports and to consider any need to modify project operation or environmental measures would ensure that National Forest System lands and other important environmental resources are protected. Opening the meeting to other resource agencies would assist with interpretation of monitoring results and ensure that the full range of effects of any proposed changes in operation or measures are fully considered. As a result, we recommend that this consultation meeting be inclusive of all project operations and facilities, not just those located on National Forest System lands.

Since 1999, PG&E has operated the project based upon an annual Project Operations and Maintenance Plan that was developed after consultation with Cal Fish & Game, NMFS, and FWS. This plan outlines the procedures and practices followed by PG&E in the operation and maintenance of the project facilities with the goal of protecting and enhancing habitat for spring-run Chinook salmon in lower Butte Creek.

PG&E's proposal to develop and implement a long-term operations plan, consistent with Forest Service condition 24 and recommendation 15, Cal Fish & Game recommendation 4, FWS recommendation 13 and NMFS recommendation 8, is similar in intent and includes the current, annual Project Operations and Maintenance Plan. This long-term operation plan would utilize information from previous year's operating plans and results collected through recent relicensing studies, and the results of future monitoring efforts to define long-term procedures and practices in an attempt to provide habitat conditions that support healthy populations of spring-run Chinook salmon and steelhead in lower Butte Creek, as well as other aquatic species in all of the project-affected reaches of Butte Creek and the West Branch Feather River.

Water temperatures in the project area are manipulated and controlled to some extent by project operations. As such we recommend that our water temperature monitoring be incorporated in the long-term operations plan, as provided for by Forest Service recommendation 15, FWS recommendation 13, and NMFS recommendation 4. The long-term operations plan would allow this information to be compiled and used to inform proposals to manage and provide protective habitat conditions for the ESA-listed anadromous fish in lower Butte Creek, through alterations to project operations or facilities. Further, it would be prudent to consider all monitoring information gathered

as a result of new license conditions, not just temperature, when evaluating long-term modifications to project operations or facilities. Using all monitoring data collected during any new license term in the decision-making process, would support decisions on how to annually modify project operations to best protect the ESA-listed anadromous fishery within Butte Creek on an as-needed basis and through the annual Project Operations and Maintenance Plan and the adaptive management program we recommend, as discussed below.

A Commission approved long-term operations plan also would serve as an overarching plan to guide the development of the annual Operations and Maintenance Plan, incorporating current and historical monitoring data and "lessons learned" from the implementation of previous annual operations and maintenance plans. A Commission-approved long-term operations plan could provide the flexibility for the agencies[79] and PG&E (the Operations Group) to actively modify project operations (within the realm of the approved plan) to protect the ESA-listed anadromous fish on a day-to-day basis. However, we note that this operational flexibility would be limited by the requirements of any license issued by the Commission. If new measures or facilities are needed to expand operational flexibility, these measures or facilities must be approved by the Commission prior to implementation. We find that providing the flexibility to actively manage project operations for the federally listed Chinook salmon and steelhead trout justifies the estimated $16,900 annualized cumulative cost of the long-term operations plan and the annual consultation and development and implementation of the annual operations and maintenance plans.

We note that the Conservation Groups in their comments and recommendations requested that they be included as a member of the Operations Group. While we find that consultation on project operations and the long-term operations plan should involve all interested stakeholders, the ultimate decision-making process should be limited to the jurisdictional agencies, including the Forest Service and PG&E.

Regarding Cal Fish & Game's recommendation to incorporate adaptive management into a new license and provisions for a summary report with adaptive management provisions, such provisions would: (1) support long-term changes to project operations and/or facilities, (2) could be used to evaluate project operations to ensure required measures are adequately protecting aquatic and terrestrial resources in both the West Branch Feather River and Butte Creek watersheds, and (3) if deemed appropriate, as a result of our recommended biotic monitoring programs, allow for an informed decision-making process for modifying project operations and/or facilities to better protect aquatic and terrestrial resources. Additionally, the adaptive management

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[79] We define the agencies as they pertain to the long-term operations plan and the Operations Group to be NMFS, Cal Fish & Game, FWS, the Forest Service, and the Water Board.

program could be used to update and modify the long-term operations plan to incorporate current biotic monitoring data and "lessons learned" from the implementation of the annual operations and maintenance plans.

Therefore, we recommend that PG&E develop, after consultation with the agencies, and submit a comprehensive monitoring and adaptive management summary report, by April 1 every 5 years, beginning in year 9 of any license issued. The report would include details of the previous year's monitoring efforts and a trend analysis of all monitoring efforts to date. The report may also include recommendations for alterations in project operations or facilities and to the long-term operations plan. However, again we note that any recommended alterations that would violate the license requirements or require modifications to project facilities would need to be approved by the Commission before implementation. We conclude that the potential environmental benefits of implementing the adaptive management program warrant the estimated annualized cost of $3,400.

**Terrestrial Resources**

*Invasive Weed and Vegetation Management*

Invasive weeds occur throughout the project area. Project operations, maintenance, and recreation can act as a method of seed dispersal and create disturbed areas favorable to the spread of invasive weeds. PG&E's invasive weed management and vegetation management plans would ensure that invasive weed species are appropriately controlled and that vegetation management activities are carried out in a way to minimize effects on natural resources.

Modifications to the plan specified by the Forest Service 4(e) condition 31 include provisions that would require PG&E to develop a source of local native plant materials for revegetation projects so that a sufficient source would be available throughout the life of the project and specify when use of persistent non-native, non-invasive plant material is permitted. We conclude that these measures are reasonable and would have negligible costs.

Cal Fish & Game recommends and the Forest Service specifies that PG&E prepare an aquatic invasive/noxious plant management plan that outlines best management practices for the prevention of invasive aquatic species. PG&E includes an adaptive management element in its plan to implement methods for the prevention of aquatic invasive species, as necessary. PG&E should ensure that its proposed aquatic plant management plan incorporates best management practices to prevent the spread of invasive aquatic species. This would not increase the cost of the plan.

The invasive weed management and vegetation management plans only cover Forest Service lands, excluding PG&E and private lands located within the project

boundary. Invasive weed populations are known to occur outside National Forest System lands, such as in the highly disturbed areas near the DeSabla forebay and adjoining day-use area. We recommend that PG&E expand these plans to include all lands within the project boundary to the extent that access is allowed.

The estimated annualized cost for the recommended invasive weed management and vegetation management plans is about $30,900 per year. Expanding the plan to accessible project lands outside National Forest System lands would increase the cost by an additional $20,900 per year. This would be a moderate cost to the project and would provide adequate protection to native plant species within the project boundary.

*Special-status Species*

A number of state-listed and state species of concern, federally listed, and Forest Service sensitive species occur within the project area or have the potential to occur. The annual review of the current list of federally listed species, Forest Service sensitive species, and the Lassen and Plumas National Forest Watch List and development of protective measures, as needed, proposed by PG&E, would provide a mechanism for the evaluation of effects of project operation and maintenance on newly listed species and development of appropriate protective measures. This measure, however, would only cover Forest Service lands. This measure should be implemented for the continued protection of special status species throughout the project area. We also conclude, however, that the annual review and potential study plans should be done for all lands within the project boundary. Expanding the surveys to include all lands within the project boundary would provide the same level of monitoring and protection for special status species throughout the project area on lands under Commission jurisdiction. We recommend that the review be expanded beyond Forest Service sensitive species to include BLM sensitive/watch list species and federal and state rare, threatened, or endangered species and all accessible project lands, as recommended by FWS. This would provide additional protection to special status species throughout the term of the license. We conclude that the benefits of the review of special status species on project lands would be worth the estimated annual cost of $5,000.

The biological evaluation of the potential effects of future actions on Forest Service sensitive and/or management indicator species or their critical habitats, specified in Forest Service 4(e) condition 27, would help ensure that existing populations of special status species and newly discovered species would not be adversely affected by new project-related construction. We agree that these measures should be implemented for the continued protection of sensitive and listed species in the project area. Special-status species, such as the Butte County morning glory, however, are known to occur on PG&E lands close to project facilities. Therefore, we recommend that the evaluation be expanded to include all accessible project lands. We further recommend expanding the evaluation to include federally listed and candidate

species and their habitats, as recommended by Interior. This would ensure that all special-status species are protected. The cost of this measure is unknown since it would depend on future undefined actions. This evaluation would ordinarily be prepared prior to any future actions that have the potential to affect a special status species.

*Foothill Yellow-legged Frog Monitoring*

As discussed in the section 3.3.2 and 3.3.3, increases in minimum flows and continuing flow fluctuations could affect habitat for the foothill yellow-legged frog resulting from reduced habitat suitability, increased water temperatures, and changes in aquatic and riparian vegetation and channel morphology. Monitoring could detect any changes in foothill yellow-legged frog populations and identify the need for changes in project operation.

The Forest Service specifies PG&E monitor foothill yellow-legged frogs on the West Branch Feather River within the National Forest on an annual basis for the first 5 years of the license and 4 years before relicensing studies commence and six additional surveys interspersed between the two monitoring periods. The initial 4 years of surveys would include egg masses, tadpoles, and adults. Surveys after the initial 4 surveys would only include egg mass data. FWS recommends annual monitoring of egg masses, tadpoles, and adults on both the West Branch Feather River and Butte Creek at 13 relicensing survey locations where all life stages were found for the first 4 years and last 4 years of the license and seven additional surveys evenly spaced out during the remainder of the license term.[80] The Forest Service initially specified that PG&E monitor foothill yellow-legged frogs on an annual basis for the first 10 years of the license and every 5 years thereafter for the term of the license. FWS initially recommended annual monitoring every 3 years after the initial 10-year monitoring period. Presumably, the agencies developed the changes to reduce the cost of the monitoring program.

PG&E filed an alternative condition that provides for full reach surveys (egg masses, tadpoles, and post-metamorphic frogs) at four relicensing sites areas of the West Branch Feather River for 3 consecutive years after the issuance of the license, then every 5 years thereafter. PG&E estimates that monitoring would cost about $55,000 per year of surveys for the West Branch Feather River. We estimate the costs of monitoring both the West Branch Feather River and Butte Creek to be about $125,000 per year of surveys. Total annualized monitoring costs would be $61,500 for FWS' recommendation, $33,500 for the Forest Service's condition, and $21,900 for PG&E's

[80] The Forest Service initially specified that PG&E monitor foothill yellow-legged frogs on an annual basis for the first 10 years of the license and every 5 years thereafter for the term of the license. FWS initially recommended annual monitoring every 3 years after the initial 10-year monitoring period.

alternative condition. The number of surveys would depend on the term of the license as summarized below:

| Recommending Entity | License Term | | |
|---|---|---|---|
| | 30 years | 40 years | 50 years |
| Forest Service | 15 | 15 | 15 |
| FWS | 15 | 15 | 15 |
| PG&E alternative condition | 8 | 10 | 12 |
| Staff (described below) | 9 | 11 | 13 |

As the license term increases, the disparity between numbers of surveys decreases.

If the foothill yellow-legged frog populations are negatively affected by recommended changes in flows and ramping rates specified in a new license and subsequent temperature changes, then population monitoring could identify these factors and could provide a timely mechanism to implement project operational changes to benefit foothill yellow-legged frog. The health and range of the foothill yellow-legged frog, a Forest Service sensitive species and a California species of special concern, has substantially declined. Given the current status of the species in California and the potential effects of continued operation of the project, monitoring is necessary to prevent further declines.

As described above, PG&E and the agencies have identified numerous monitoring frequencies. Based on the life history of the foothill yellow-legged frog, a minimum 3-year period of observation is needed to detect changes in populations based on environmental changes (Kupferberg et al., 2007). PG&E's monitoring schedule does include three consecutive years of monitoring as recommended by Kupferberg et al. (2007) and additional monitoring every 5 years thereafter.

The initial surveys as provided in the PG&E alternative would allow for an accurate determination of baseline foothill yellow-legged frog distribution and changes in distribution that may result from changes in project operation. The subsequent surveys would allow the assessment of longer term changes in habitat and breeding success. If short- or long-term effects are detected, the implementation of additional studies targeted on identifying the mechanism of such effects and developing mitigation measures would be appropriate at that time.

The determination of the number of surveys during the license term is a trade-off between cost and the value of the additional data. We do not find that there is sufficient information to justify the additional costs of the agency-recommended survey schedule.

We conclude that the benefits of protecting this special-status species are worth the estimated annual cost of $44,200 for PG&E's alternative sampling schedule.

Therefore, PG&E should develop a monitoring plan to identify the effects of the changes in flow releases on foothill yellow-legged frog and any changes in population numbers to form a basis for the needs for changes in project operation or additional studies. Monitoring should include all foothill yellow-legged frog habitat potentially affected by changes in project operation on both Butte Creek and the West Branch Feather River according to PG&E's alternative sampling components and schedule. Our recommendation remains unchanged from the draft EA. We, however, conclude that the initial annual surveys should be increased to four instead of three, to be more consistent with the agency recommendations. This is important to ensure a sufficient baseline period, which can be affected by weather or other unpredictable events. The additional surveys would add $5,400, a small additional annual cost, raising the total annual cost to $49,600.

A key component of the agency-recommended monitoring plans is the conduct of four annual surveys prior to the next relicensing in order to have a baseline for evaluating the next license. We do not find that it is appropriate to condition a license to develop information that might be useful in subsequent relicensing proceedings. Those monitoring results would not be designed to develop information relevant to the pending relicensing but for some future relicensing. Such surveys would be premature given the speculative nature of what information may be needed for the next relicensing or whether the project would even be relicensed. There would be an opportunity to collect any necessary baseline data to supplement ongoing monitoring results as part of any subsequent relicensing proceeding.

The Forest Service and FWS would also, as described in more detail in section 3.3.3.2, have PG&E develop a population model linking various life stage data; relate egg mass counts quantitatively to adult population size or overall population growth rate; and conduct a population viability analysis. FWS also recommends that PG&E determine the species-specific effects of temperature on development rates of embryos and larvae, growth rates of tadpoles, and size at metamorphosis, and develop an experimental methodology to determine the relationship between discharge and stage at egg mass and tadpole sites. PG&E estimates the costs would be at least $1.75 million, but that these costs might be underestimated based on the scope of the studies. We conclude that the annual costs of the additional studies would be at least $39,700. The studies specified by the Forest Service and recommended by FWS could enhance conservation efforts for foothill yellow-legged frog, but are in excess of what is needed to monitor effects from changes in project operations. Population monitoring, as discussed above, would be sufficient to determine trends in egg mass numbers, foothill yellow-legged frog distribution, suitability of breeding and rearing habitat, and level of recruitment. Therefore, the cost of these additional studies does not justify the benefits.

The Forest Service specifies and FWS recommends that PG&E monitor water temperatures to assess effects on eggs and tadpoles. Although modeling of increased flows do not show significant effects on mainstem water temperatures, temperatures at the river edge, which were not measured, may substantially differ. Measuring water temperature in foothill yellow-legged frog habitat would provide insight into the relationship between water temperature and the initiation of breeding and time to metamorphosis. Therefore, we recommend including measurements of water temperature in the vicinity of egg masses and tadpoles in the monitoring plan. We find that additional water temperature measurements during the annual monitoring would not add much to the cost.

FWS recommends that PG&E monitor the geomorphic and riparian vegetation response to the new flow regime and reassess streamflows if substantial changes in bar geomorphology and riparian vegetation encroachment result. Riparian habitat could be affected by proposed and recommended increases in minimum flow releases and associated effects on water levels within existing riparian habitats and by potential scouring of habitat from water level fluctuations. Recording information on variables such as substrate, site morphology, channel shape and slope, water velocities, canopy, water temperature, riparian and aquatic vegetation, and the location of oviposition sites during the recommended monitoring would provide insight into the effects of flow increases on aquatic and riparian habitats and channel morphology. Therefore, PG&E should incorporate measurements of channel shape and slope and riparian and aquatic vegetation into the foothill yellow-legged frog monitoring plan. These additional measurements during annual monitoring would have a modest effect on the total cost.

*Bald Eagles*

Bald eagle populations in California are rebounding, and there are many eagles nesting in the Feather River Basin. The incidental taking of bald eagles is prohibited by the Bald and Golden Eagle Protection Act. The identification of future nesting is important in determining whether additional protection measures may be needed to protect the nesting eagles from project-related activities such as maintenance or recreation. Therefore, we recommend that PG&E develop a bald eagle monitoring plan to include development of protective measures in the event nesting is identified as a result of monitoring or through incidental observations. The plan should be consistent with the National Bald Eagle Management Guidelines (FWS, 2007).

The Forest Service specified and FWS initially recommended that surveys occur at least once per year or at a frequency to be determined in the monitoring plan, while PG&E suggested that a breeding and wintering survey every 3 years would be adequate.

Given the limited current use of the project area by eagles and the limited potential effects from recreation use or maintenance activities, monitoring every 3

years, along with incidental observations, would be sufficient to detect changes in eagle use of the project area.

Based on the analysis in the draft EA, the Forest Service modified its recommendation (Forest Service 10(a) condition 10) consistent with the staff recommendation, but suggests that an increase in survey frequency may be needed if project management actions can alter foraging habitat and that PG&E should coordinate eagle monitoring information with information from other studies. FWS also accepted the reduced monitoring schedule.

We agree that changes in project operation or facilities or management actions may necessitate the need for more frequent surveys and long-term monitoring would benefit from coordination with other studies that might affect eagle use of the project area. We also recommend that the plan provide for more frequent surveys if observations of eagles become more common. The annual $4,500 cost of the recommended surveys would be worth the benefits to future nesting bald eagles.

*Deer Protection at Canals*

PG&E's current deer protection measures led to a significant decrease in deer mortality over the last 30 years and would be sufficient to keep deer mortality at low levels (average of less than 3 deer per year). PG&E's proposal to monitor the status of the deer protection facilities (bridges, escape structures, etc.) and replace them as necessary would help ensure that mortality remains at current levels. PG&E would continue to record wildlife mortalities, but does not address how it would deal with the possibility of increases in mortality over the term of the license based on changes in circumstances, such as reduced effectiveness of the facilities or increases in deer numbers. The cost of monitoring the protection would be negligible since it would likely be part of the existing facilities maintenance plan. The cost of replacing facilities would depend on the number and types of facilities that may have to be replaced during the license term. We estimate that this measure would have an annualized cost of $9,600 and would be justified by the benefits to the local deer herd.

We recommend that PG&E prepare a summary mortality report every 5 years, as recommended by Cal Fish & Game, and implement additional measures if an increasing trend in animal mortalities is noted, as specified by Forest Service and recommended by Cal Fish & Game. Developing the mortality reports would have a minimal annualized cost of $100, but would reveal the need for additional protection measures.

**Threatened and Endangered Species**

*Valley Elderberry Longhorn Beetle*

Clearing vegetation that may threaten project facilities during the life of the project may result in a loss of elderberry shrubs that provide potential habitat for the VELB, a species listed as threatened. PG&E has in a place a system-wide VELB Conservation Program that includes the project area. The program provides for pre-construction surveys, educational training, implementation of minimization, avoidance, and protective measures, and monitoring.

Continued implementation of the program at the project would ensure that impacts on elderberry habitat would be avoided or minimized, and if impacts do occur, appropriate mitigation would be implemented. Therefore, we recommend that PG&E implement the program in relation to continued operation and maintenance of the project. The annualized cost of $4,800 for implementing the program would be worth the benefits to the VELB, a federally listed threatened species.

Actions to identify newly listed species and appropriate protection measures are discussed above under *Special-status Species*.

*Central Valley Chinook Salmon and Central Valley Steelhead*

Details on our recommendations and analysis thereof for Chinook salmon and steelhead can be found in section 3, and above in this section under *Aquatic Resources*. For the protection and enhancement of Chinook salmon and steelhead, and their designated critical habitat, we recommend the following measures:

- Develop, after consultation with the Forest Service, the Water Board, NMFS, Cal Fish & Game, and FWS, and implement upon Commission approval, a long-term operations plan that includes the development of an annual project operations and maintenance plan.
- Monitor water temperature, DO, turbidity, and herbicides (if in use) in receiving streams, upstream and downstream, of canal discharge within 24 hours prior to, during, and within 24 hours of returning project canals to service, and provide a summary of cleaning and maintenance activities as well as the monitoring results to the Water Board, and file a summary report with the Commission within 30 days of completing the monitoring and any associated laboratory analysis.
- Develop, after consultation with the Forest Service, NMFS, FWS, and Cal Fish & Game, and implement, upon Commission approval, a hazardous substances plan.

- Provide the following minimum instream flows below the Lower Centerville diversion dam:

| | | | |
|---|---|---|---|
| Lower Centerville diversion dam | 75 cfs | 60 cfs | Sept. 15 to Jan. 31 |
| | 80 cfs | 75 cfs | Feb. 1 to April 30 |
| | 80 cfs | 65 cfs | May 1 to May 31 |
| | 40 cfs | 40 cfs | June 1 to Sept. 14 |

- If it is determined that implementing an increased minimum instream flow of 10 cfs during wet water years may compromise Philbrook reservoir storage, after consultation with the Operations Group, alter or reduce minimum instream flows to 2 cfs.
- Develop, after consultation with the Forest Service, the Water Board, the Conservation Groups, NMFS, Cal Fish & Game, and FWS, and implement upon Commission approval, a DeSabla forebay water temperature improvement plan that addresses the installation of a pipe to convey water from the terminus of Butte canal to the DeSabla forebay intake. Also, include a provision to monitor water temperatures in Butte Creek and DeSabla forebay for a period of 5 years after the device is operating and submit annual reports on these results to FWS, NMFS, Forest Service, Cal Fish & Game, the Water Board, the Conservation Groups, and the Commission.
- Develop, after consultation with the Forest Service, Cal Fish & Game, NMFS, and FWS, and implement upon Commission approval, a ramping rate plan for lower Butte Creek.
- As soon as drought conditions are evident, notify the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board and the Commission, and consult with these agencies, as needed, on potential proposals for modified project operations.
- File, for Commission approval, any proposed modifications to project operations as a result of drought conditions consultation with the agencies.
- Construct, operate, and maintain, after consultation with USGS, a streamflow gage with real-time capability in Philbrook Creek, downstream of the confluence of both the low level release and spill channel in Philbrook Creek.
- Operate and maintain, after consultation with USGS, the existing gaging stations on the West Branch Feather River downstream of Round Valley reservoir and the Hendricks diversion dam.
- Measure minimum instream flows as the 24-hour average of the flow (mean daily flow) and as an instantaneous flow, with instantaneous 15-minute stream flow as required by USGS standards at all gages.

- Measure and document all minimum instream flow releases in publicly available and readily accessible formats, and provide this data to USGS in an annual hydrology summary report.
- Construct, operate, and maintain, after consultation with USGS, a water temperature and reservoir level gage in Philbrook reservoir with real-time capability.
- Provided there is safe access for PG&E employees to access project facilities at Philbrook reservoir, PG&E should make any necessary adjustments to the minimum instream flow release valve as quickly as possible, or within 2 hours, in response to heat-related events.
- As a result of annual consultation and adaptive management, construct, operate, and maintain up to three additional streamflow gages, upon Commission approval.
- Develop, after consultation with Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and implement, upon Commission approval, a water temperature monitoring plan, to be incorporated as part of the long-term project operations plan.
- Submit an annual report detailing temperature monitoring results to the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and the Commission prior to annual consultation.
- Monitor benthic macroinvertebrate populations to evaluate their response to changes in project operations such as minimum flows.
- Annually monitor anadromous fish and their designated critical habitats in Butte Creek.
- Develop and implement an adaptive management program to guide the long-term operations of the project to protect the federally listed anadromous fish within Butte Creek that considers the aquatic resources of the West Branch Feather River.
- Develop and implement a fish screen and passage plan for the Hendricks diversion dam that allows for additional flows needed to operate a fish ladder and provide passage to be reallocated to lower Butte Creek to protect listed ESA anadromous fish and designated critical habitat if deemed appropriate by the Operations Group.

*North American Green Sturgeon*

Because green sturgeon do not occur in Butte Creek, or in proximity to the project area, relicensing the DeSabla-Centerville Hydroelectric Project with the staff-recommended measures would have little, if any effect on the green sturgeon.

However, the DeSabla-Centerville Hydroelectric Project does, as described in section 3, provide for the inter-basin transfer of water from the West Branch Feather River to Butte Creek. This transfer of water would ultimately reduce the amount of flow in the Feather River downstream of the diversion. This inter-basin transfer of water occurs upstream of Lake Oroville. Given the presence, operation, and size of Lake Oroville, it is likely that any effects associated with the inter-basin transfer of the West Branch Feather River's water to Butte Creek would be attenuated downstream of Lake Oroville in the lower Feather River, where green sturgeon have been observed.[81]

Additionally, as identified above, we recommend several measures for the benefit of the federally listed Central Valley Chinook salmon and the Central Valley steelhead, in lower Butte Creek. Because the habitat and water quality requirements of these salmonid species would also support the needs of the green sturgeon, we find that if green sturgeon were to occupy lower Butte Creek, and are found in the project's vicinity, our recommended measures for Chinook salmon and steelhead would also protect the green sturgeon.

**Recreation Resources**

*Recreation Rehabilitation and Enhancements*

PG&E proposes to develop and implement a recreation facility rehabilitation and ADA upgrade plan for the existing recreation facilities at Philbrook reservoir and DeSabla forebay within 1 year of license issuance. PG&E also proposes to upgrade existing recreation facilities and improve accessibility over the term of the license, as discussed in section 3.3.5, *Recreation Resources*. PG&E's proposal would provide enhanced accessibility to recreation opportunities at the project and would ensure the proposed recreation accessibility measures and upgrades would be implemented over the term of a new license. Based on the specificity of the measures described in PG&E's proposed plan, we recommend PG&E implement the measures outlined in the recreation facility rehabilitation and ADA upgrade plan after consultation with the Forest Service within 5 years and file a report upon completion of each of the measures.

We estimate the annualized cost associated with implementing the recreation facility rehabilitation and ADA upgrade plan, the rehabilitation measures, and the minor maintenance measures would be $19,200. Given the benefits identified above, we conclude that these benefits are worth the costs.

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[81] More information on Lake Oroville and its operations can be found in the Commission's May 18, 2007, Final Environmental Impact Statement prepared for the relicensing of the Oroville Facilities Project (FERC, 2007).

The Forest Service specifies several additional capital improvement measures, including extending the concrete boat launch on Philbrook reservoir. Currently the boat launch is operational during the primary recreation season; however, it is not adequate because it does not extend to the low water line and on occasion, boaters are forced to launch from compacted soil below the boat launch. Our analysis indicates that there is a demand for adequate recreational boating access and the Forest Service's specified improvement would further improve the existing facility. We recommend PG&E extend the concrete boat launch on Philbrook reservoir within 1 year of license issuance and file a report upon completion of this measure. We find the addition of this improvement would have an annualized cost of $500, and we conclude that the benefits would be worth the cost.

The Forest Service also specifies PG&E fund and the Forest Service install restrooms, at $40,000 each (in 2008 dollars), to meet Forest Service guidelines at the Philbrook reservoir day-use area and boat launch within 1 year of license issuance. We agree that installing new restrooms would improve the current recreation facilities at Philbrook reservoir; however, a licensee cannot satisfy the obligation to perform certain tasks by a simple payment to another party, nor can the obligation be limited by a particular dollar figure. We consider the licensee's obligation to be to complete the measures required by license articles, in the absence of authorization from the Commission to the contrary. Therefore, we do not recommend PG&E fund the Forest Service $40,000 for each restroom but that PG&E install new restrooms at Philbrook reservoir day-use area and boat launch as a part of the recreation management plan.

The Forest Service specifies measures to upgrade and maintain an existing user-created trail and parking along Toadtown canal and construct and maintain public pathways from three new Forest Service access roads and public parking areas to the southeastern shoreline of Philbrook reservoir. Upgrading and maintaining an already existing user-created trail and parking would provide enhanced accessibility to recreation opportunities at the project in the vicinity of the Toadtown canal. Originally, we concluded the intent of these paths was to provide direct access from the private cabins located on the southeastern shoreline to the reservoir. After further clarification from the Forest Service, we understand that these paths are intended for public access. Clearly identifying a pathway for public use to the southeast shoreline of Philbrook reservoir from the new Forest Service public parking areas would improve access and decrease conflicts with the existing private cabin owners. We recommend PG&E upgrade the existing user-created trail and parking along Toadtown canal within 1 year of license issuance and file a report upon completion of this measure. We estimate the annualized cost of these measures would be $2,500, and we conclude that the benefits would be worth the costs.

In addition to the rehabilitation measures, the Forest Service specifies that PG&E provide the Forest Service with 15 to 20 percent of the camping fees collected from

National Forest System lands at Philbrook Campground and consider placing a portion of the campground under a reservation system. PG&E is ultimately responsible for the recreation facilities within the project boundary; therefore, use of camping fees collected at Philbrook Campground would be under the discretion of PG&E for costs associated with operation and maintenance of the campground. We do not recommend PG&E provide the Forest Service with 15 to 20 percent of camping fees; however, we do find it reasonable for PG&E to consider placing a portion of Philbrook Campground under a reservation system to make it easier for visitors to reserve a camp site.

FWS recommends that PG&E develop rehabilitation measures to improve recreation at the Forest of Butte Creek campground, the Ponderosa Bridge Parking area, and the Butte Creek trail. These facilities are located outside the project boundary and are not needed for project purposes. PG&E is currently meeting camping needs and provides public access to project lands and waters through both the Philbrook and DeSabla recreation areas. Therefore, we do not recommend these additional enhancement measures recommended by FWS.

CSSA recommends that PG&E construct a public day-use area with ADA accessible facilities at Round Valley reservoir (Snag Lake), and stock the reservoir with trout during the spring season. Under current project operations, there are no fish stocked at this reservoir and the reservoir itself is completely drained within 1 month during the summer season, resulting in little to no recreation use. For the reasons stated above, we do not recommend PG&E stock trout in Round Valley reservoir or construct a day-use area.

*Dispersed Camping and OHV Use*

PG&E's proposal to work with the Forest Service to discourage dispersed camping, trash dumping, and OHV use at the project would ensure a high quality recreational experience and enhance public safety. Further, measures to block vehicle access and discourage dispersed camping and OHV use would also provide protections to environmental resources within the project. PG&E is ultimately responsible for the operation and maintenance of the project's recreation facilities located within the project boundary and needed for project purposes. The Willows Dispersed Area, the West Branch Feather River Bridge crossing, and the former West Branch Campground site are all located outside the project boundary, but due to their proximity to the reservoir, it is likely that visitors to the project utilize these areas and these one-time measures would be appropriate. We estimate the annualized cost for these measures to be $6,000, and conclude that the benefits would be worth the costs.

*Fish Stocking*

PG&E proposes to continue to fund Cal Fish & Game up to $10,000 annually in years in which Cal Fish & Game stocks rainbow trout in DeSabla forebay. This would

amount to about 3,311 pounds of trout. Cal Fish & Game contends that, under a 1983 agreement with PG&E, the applicant agreed to annually reimburse Cal Fish & Game for the stocking of 14,435 trout, or approximately 7,200 pounds. Angling is a primary recreation activity at the project, and the DeSabla forebay is a popular fishing spot with local residents. While PG&E is ultimately responsible for stocking the reservoirs and reaches associated with the project, we recognize Cal Fish & Game's expertise in this area. Therefore, we recommend PG&E develop a fish stocking plan, after consultation with Cal Fish & Game, to include the amount and location of fish to be stocked at DeSabla forebay, Philbrook reservoir, and other affected stream reaches at the project. Creels surveys conducted through recreation monitoring, as discussed in the *Recreation Monitoring* section below, will be used to evaluate this plan and measure angler satisfaction every 5 years. Hence, the number of pounds of fish to be stocked could fluctuate up or down on a 5-year cycle depending on survey results. During the first 5-year cycle, PG&E would be expected to stock 7,200 pounds of trout annually. We estimate the annualized cost for this measure to be $22,000, and conclude that the benefits would be worth the costs.

*DeSabla Forebay*

PG&E proposes to construct and operate a pipe to connect the terminus of Butte canal to the DeSabla intake to reduce thermal loading as a part of the water temperature improvement plan. Upon implementation of this plan, operating this pipe may have the potential to negatively impact the current recreational trout fishery through loss of fish and or stagnation due to the loss of consistent, cool water inflow to the forebay and resulting warmer temperatures. Further, loss of the recreational fishery may deter use at the DeSabla Group Picnic area as well. Angling is one of the most popular activities associated with the project and, because DeSabla forebay is a popular fishing spot at the project, we recommend PG&E develop and implement a plan to monitor the aesthetic value of the DeSabla forebay for 1 year following installation of the temperature reduction device. In addition, we recommend PG&E file a report, after consultation with Cal Fish & Game and the Water Board, to include a description of the effects of the temperature reduction device on the aesthetic value and recreational fishery of the DeSabla forebay and proposed measures to mitigate for any negative impacts, if any, on the recreational fishery or aesthetic values of the DeSabla forebay and associated with the installation of the pipe. We estimate the annualized cost for this measure to be $18,000, and conclude that the benefits would be worth the costs.

*Recreation Monitoring*

Both the Forest Service and BLM specified that PG&E develop recreation use monitoring, reporting, and use triggers in consultation with both agencies to periodically monitor changes in recreation use patterns at the project every 5 years. Additionally, the Forest Service specifies that PG&E include an annual boat count on Philbrook reservoir with triggers in place to support reservoir-based recreation and identify

excessive use or potential user conflicts on the reservoir. The FERC Form 80 already requires facility capacity and demand be reported every 6 years; however, the additional recreation report would provide more specific information such as changes in use patterns and whether or not resource damage is occurring. Conducting the recreation monitoring, to include both creel surveys and boat monitoring protocol, every 5 years would allow for enhanced assessment of the adequacy of public recreation facilities and access at the project. Therefore, we recommend PG&E develop recreation use monitoring, reporting, and use triggers, with the inclusion of creel surveys and an annual boating check, every 5 years. We estimate the annualized cost for this monitoring to be $75,000 (every 5 years), and conclude that the benefits would be worth the costs.

*Law Enforcement*

Both the Forest Service and BLM specify that PG&E provide funding for a patrol position at the project. Butte County and the Conservation Groups recommend the same. Although more visible patrol or law enforcement may help reduce conflicts between recreation users and improve visitor safety, the state and county are responsible for law enforcement activities at public recreation sites, including within the project area. Further, the Commission has no way of ensuring that the hiring of personnel paid for by the licensee (in this case, funding a seasonal employee), actually would accomplish a project purpose or ameliorate a project effect. There would be no indication that existing recreation conflicts would be reduced through the proposed measure; therefore, we do not recommend that PG&E provide patrol or funding for a law enforcement position.

**Land Use and Aesthetic Resources**

*Transportation System Management Plan*

PG&E proposes to implement a transportation system management plan to ensure that responsibilities and schedules for coordination and maintenance of project roads would be clearly defined. In addition, the Forest Service specifies that PG&E include an inventory of roads necessary for the project, implement temporary traffic controls during construction, and develop a traffic monitoring plan to help determine project-associated use on roads within the project area and assist in the development of road share costs. Many project roads pass through land managed by the Forest Service, and therefore we consider it important to delineate PG&E and the Forest Service's responsibilities to ensure that these roads are well-maintained to ensure appropriate, safe access to project facilities for inspection, operation, and maintenance purposes as well as appropriate public access to project lands and waters. However, it is the Commission's practice to require ongoing maintenance for only those roads used primarily for project purposes. At this time, we see no need to gather additional

information through a traffic monitoring plan to determine project-associated use or cost sharing responsibilities on roads outside the project boundary. Therefore, based on the detailed measures provided by PG&E, we recommend PG&E implement the proposed measures in the transportation system management plan with the addition of the road inventory and traffic controls specified by the Forest Service. These measures should be implemented after consultation with the Forest Service and other appropriate federal and state agencies within 2 years of license issuance and a report should be filed after each measure is completed. We estimate the annualized cost for this plan to be $23,000, and conclude that the benefits would be worth the costs.

*Road Maintenance*

BLM specifies that PG&E annually repair and maintain a portion of Ditch Creek Road from the BLM entrance gate to the point where the project's 9/1 spillway crosses Ditch Creek Road. Additionally, Butte County recommends PG&E update guardrails on county-maintained roads where project flumes and canals cross and pave back the apron to the county right-of-way at the project powerhouse road, just south of DeSabla forebay. PG&E is responsible for any access road within the project boundary requiring maintenance; however, these roads are not project roads. Roads located outside the project boundary are not subject to Commission jurisdiction or the terms and conditions of the license; therefore, we do not recommend these road maintenance measures.

The Forest Service recommends in its comments filed February 27, 2009, that the West Branch Feather River road crossing (designated as BW45 road on table 3-42 in the EA) be designated as a project road by the Commission and that it be included in the project boundary if a new license is issued. Because this road is used by PG&E to access a project gage below Round Valley reservoir when spill flow prevents access across the dam, we agree with the Forest Service and therefore recommend bringing BW45 road within the project boundary.

*Land Management Plans*

The development of a fire management and a visual management plan would provide the means for coordinating emergency response preparedness and prevention for both fires and hazardous substances at the project. In addition, visual management measures would reduce the visual effects on aesthetic resources at the project and help to restore natural habitat at the project. We estimate developing a fire management plan would have an annualized cost of $1,000, and the development of a visual management plan would have an annualized cost of $1,500. Given the benefits of improved public safety and reduced potential damage to property and natural resources, we conclude that the benefits of these measures are worth the costs.

## Cultural Resources

*National Register of Historic Places Eligibility*

As part of the required cultural resources surveys, PG&E surveyed all accessible project lands within the APE for cultural resources and conducted evaluations to determine which, if any, of them were eligible for inclusion in the National Register. Informal evaluations were conducted for prehistoric sites and PG&E found that of the 29 identified sites, 10 sites may be eligible, two are eligible as contributing elements, and the remaining sites are considered ineligible. In addition, as part of this historic sites and structures inventory, PG&E evaluated the DeSabla-Centerville Hydroelectric project facilities for National Register-eligibility. The system contains several features that are eligible for inclusion on the National Register as contributing elements to a historic district. Based upon the information provided by PG&E, we concur with PG&E's findings of eligibility and conclude that the resources indentified in that report warrant consideration regarding their eligibility for inclusion on the National Register.

*Historic Properties Management*

PG&E developed an HPMP to manage historic properties within the APE of the project. In the HPMP, PG&E proposes to conduct monitoring of sites within the project area that are eligible for listing on the National Register. In addition, the HPMP includes additional mitigation and management measures for historic properties affected by the project, as well as proposals for continuous cultural resource consultation with BLM, the Forest Service, the Mechoopda Tribe, and Greenville Rancheria throughout the term of the license. The HPMP also includes a proposal for annual monitoring reports and consultation meetings, and meetings to review and revise the HPMP after 5 years and then again every 10 years, thereafter. The Forest Service 4(e) condition 35 also requires finalization and implementation of an HPMP.

BLM, Greenville Rancheria, Mechoopda Tribe, and the Forest Service commented on the HPMP, but PG&E filed the HPMP prior to incorporating the comments. BLM, Mechoopda Tribe, and the Forest Service provided recommendations to improve the HPMP, including additional contextual information, consulting requirements, and requests for more specific information and treatment measures. While the commenting agencies and Tribes and PG&E label the HPMP as a draft document, most of the requests for additional information can be addressed through the consultation protocols already set forth in the February 2008 HPMP. As discussed in section 3.3.6.2, however, some of the comments address issues not originally included in the HPMP that would benefit the protection and enhancement of cultural resources.

As such, we recommend implementation of PG&E's HPMP with the following additions: (1) update the February 2008 HPMP with the additional historic context information provided by BLM, the Forest Service, and the Mechoopda Tribe;

(2) develop a collection policy for discovery, curation, and disposition of artifacts, noting that all artifacts from National Forest System lands remain the property of the Forest Service; (3) develop a detailed HPMP section addressing identification, restoration, accessibility, and stewardship collaborations for traditional plant gathering/tending in wetlands and riparian habitat communities culturally important to participating Tribes; (4) identify specific management measures to be undertaken and include them within PG&E's best practices or procedural manuals; and (5) include mitigation measures for the Round Valley reservoir site CA BUT 1225/H, the Philbrook Lake Tenders Cabin, and other sites as determined necessary during consultation with applicable agencies and participating Tribes. We recommend that these measures be included within the February 2008 HPMP within 60 days within any license issued for this project.

PG&E also states that the National Register-eligible Centerville powerhouse most likely will need to rebuilt or refurbished within the next 10 years. The HPMP states that all maintenance, repair, alteration, replacement, and new construction that may be necessary at the project would be performed in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties and in consultation with the California SHPO. While routine modifications and repairs at Centerville powerhouse normally would be covered under these management measures, no specific plans for rebuilding or refurbishing the powerhouse have been filed and therefore none are addressed in the HPMP. Until a specific plan to refurbish or replace the powerhouse has been developed, we do not recommend that the HPMP address this issue.

In order to implement the protections provided by the HPMP, Commission staff will issue a final PA among the Commission and California SHPO, pursuant to our responsibilities under section 106 of the National Historic Preservation Act. With the execution of a PA and implementation of the HPMP, all anticipated effects on any historic properties within the APE would be resolved. We estimate that revision of the February 2008 HPMP would have an annualized cost of $19,300, and we conclude that the expected benefits of implementing the HPMP with the recommended modifications are worth the cost.

## 5.3 UNAVOIDABLE ADVERSE IMPACTS

The continued operation of the project would continue to divert water from the West Branch Feather River and Butte Creek, and feeder creeks thereby limiting flows downstream of the diversions. Additionally, large mammals will continue to be entrained in project canals, and some minor unavoidable adverse effects on geologic, soils, and geomorphic resources would continue to occur. These could include some continued erosion associated with project operations, renovation of recreation facilities, installation of DeSabla Forebay Temperature Improvement Facility, and removal of five feeder diversions.

We have identified no other unavoidable adverse effects on resources influenced by the project.

## 5.4 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(E) CONDITIONS

### 5.4.1 Recommendations of Fish and Wildlife Agencies

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

In response to our ready for environmental assessment notice, the following fish and wildlife agencies submitted recommendations for the project: FWS (on June 27, 2008), and NMFS and Cal Fish & Game (each on June 30, 2008). In the draft EA, we determined that 28 of these recommendations may be inconsistent with the purpose and requirements of the FPA or other applicable law.

To resolve these inconsistencies, we conducted three 10(j) meetings with representatives from Cal Fish & Game, NMFS and FWS on April 13, 2009; May 18, 2009; and June 29, 2009. During the meetings, Commission staff presented a revised preliminary recommendation in an effort to resolve the remaining inconsistencies.[82] As a result of the 10(j) process and its conclusion on June 29, 2009, we resolved many of the inconsistencies identified in our draft EA.

Agencies filed 54 different recommendations. We determined that 25 of the 32 10(j) recommendations made by Cal Fish & Game, 17 of the 19 10(j) recommendations made by NMFS, and 35 of the 43 recommendations made by FWS were within the scope of section 10(j). Of those recommendations falling within the scope of section 10(j), we have now determined that 1 of the 25 recommendations made by Cal Fish & Game, 2 of the 17 recommendations made by NMFS, and 2 of the 35 recommendations made by FWS may be inconsistent with the purpose and requirements of the FPA or

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[82] Details of the revised preliminary recommendation were presented in the Commission's May 22, 2009 issuance and can be viewed at: http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=13721797

other applicable law. These recommendations are for: (1) foothill yellow-legged frog monitoring in Butte Creek (FWS); (2) fish screening of Lower Centerville diversion (NMFS); and (3) minimum instream flows in lower Butte Creek downstream of Lower Centerville diversion dam (FWS, NMFS, and Cal Fish & Game).[83]

Several of the inconsistent recommendations contained in the draft EA were resolved through the section 10(j) process, including: (1) resident fish monitoring; (2) benthic macroinvertebrate monitoring; (3) annual fish stocking; (4) implementing a revised drought operational plan; (5) minimum instream flows in lower West Branch Feather River; (6) minimum instream flows in Cunningham Ravine, Little West Fork, and Long Ravine creeks;[84] (7) recommended minimum instream flows for Inskip, Kelsey, and Clear creeks; and (8) the installation of three additional streamflow gages as a result of annual consultation.

We discuss the reasons for our preliminary 10(j) determination in the following section of this final EA. Table 5-2 (at the end of the discussion) indicates the basis for our preliminary determination concerning the measures we consider within the scope of section 10(j). Our findings for recommendations found to be within the scope of 10(j) but inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, are based on our determination that the costs of the measures outweigh the expected benefits.

**Minimum Instream Flows, Fish Ladder and Fish Screen at Hendricks Diversion Dam**

In the draft EA, we did not recommend Cal Fish & Game's and FWS' recommendation for the installation of a fish screen and ladder at the Hendricks diversion dam. While resident fish populations within project-affected stream reaches are generally healthy and viable, we recognize that the project entrains fish into project works and therefore is likely affecting the overall density of fish populations within project-affected stream reaches. As such, in the draft EA, we recommended increasing the minimum instream flows downstream of each of the project's mainstem diversion dams to provide additional habitat for the enhancement of resident fish populations within the project-affected stream reaches, including the West Branch Feather River downstream of the Hendricks diversion.

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[83] The three recommendations listed here represent 5 recommendations in total from the 10(j) agencies.

[84] In Forest Service 4(e) condition 18.1, minimum instream flows were specified for Cunningham Ravine, Little West Fork, and Long Ravine creeks; therefore, because these conditions are mandatory, we consider this recommendation to be resolved.

Following review of the agencies response to our section 10(j) preliminary determination and comments on the draft EA, while we continue to conclude that the fish populations in the project-affected stream reaches are viable and generally healthy, we outlined a revised recommendation at the 10(j) meetings that provides protection for fish in the West Branch Feather River downstream of the Hendricks diversion at a reasonable cost consistent with the provisions of the purpose and requirements of the FPA or other applicable law. During the 10(j) meetings, it became evident to us that fish protection on the West Branch Feather River was a priority for Cal Fish & Game. Therefore, our revised recommendation includes provisions for a fish screen and ladder at the Hendricks diversion dam in lieu of increasing the minimum instream flows as we recommended in the draft EA.

FWS and Cal Fish & Game filed responses to staff's revised recommendation on June 11, 2009. FWS and Cal Fish & Game agreed with our fish screen and ladder recommendation, but filed an alternative flow regime for minimum instream flows.

Cal Fish & Game and FWS' alternative flow regime for the West Branch Feather River included a 15 cfs minimum instream flow (during dry years) downstream of Hendricks diversion dam to ensure passage connectivity within the West Branch Feather River. FWS noted that PG&E's PHABSIM calibration flows demonstrate that the 7 cfs flow identified in our revised preliminary recommendation during dry years would not support passage through the stream reach immediately downstream of the diversion dam and to the first major tributary at Big Kimshew Creek.

Based on the PHABSIM calibration flows for this reach, we agreed that passage through this stream reach at a 7 cfs minimum instream flow may be questionable. One of the purposes of operating a fish ladder at the Hendricks diversion would be to provide resident fish access to thermal refuge in the upper watershed, of particular importance during dry years. With this in mind, during the June 29, 2009, section 10(j) meeting , we recommended, in lieu of providing dry year flows of 15 cfs below Hendricks diversion dam, that PG&E develop, after consultation with the agencies, a fish passage and screen plan that would address the design and operational criteria for a fish screen and ladder at the Hendricks diversion dam, and would also specify how PG&E would provide migration connectivity through the stream reach immediately downstream of the diversion to the confluence with Big Kimshew Creek. To provide such a migration corridor in the plan, we recommended installation of fish habitat structures or other such means to increase connectivity in dry years. Additionally, we recommended that, if the fish passage and screen plan were to provide migration connectivity via stream flows greater than the minimum instream flow requirement, the additional flow could be reallocated to lower Butte Creek if needed to protect the ESA-listed anadromous fish resources there, as determined by the Operations Group.

As a result of the June 29, 2009, section 10(j) meeting, Cal Fish & Game, FWS, and the Forest Service found our recommendation for a fish passage and screen plan and 7 cfs dry year flow, as described above, to be an acceptable alternative to their recommended 15 cfs dry year flows between September 1 and February 28.

Therefore, as discussed in section 5.2, we now recommend that PG&E provide a year-round minimum instream flow below the Hendricks diversion dam of 15 cfs during normal years and 7 cfs in dry years, and develop, after consultation with FWS, NMFS, Cal Fish & Game and the Forest Service, a fish passage and screen plan for the Hendricks diversion dam. The plan should include: (1) design specifications for a fish ladder providing upstream passage over the Hendricks diversion dam, and for fish screens at the Hendricks canal entrance; (2) provisions for year-round operation of the fish ladder in all water year types; (3) provisions for ensuring migratory connectivity for rainbow trout within the West Branch Feather River between the Hendricks diversion dam and the confluence with Big Kimshew Creek; and (4) a schedule for installation of the facilities. To ensure that flows will be provided for migratory connectivity, the plan should also include provisions to allow the Operations Group to limit the flow release to only the recommended minimum instream flow (7 cfs), if any additional flow for migration connectivity is needed in lower Butte Creek to protect the ESA-listed fish and their critical habitat. If, in lieu of additional stream flows, instream habitat structures or other such methods are proposed to ensure migratory connectivity, the plan should include a detailed description of the measures to be implemented.

As a result of the 10(j) meetings, we now consider the inconsistencies associated with Cal Fish & Game and FWS' recommendations for minimum flows below Hendricks diversion dam to be resolved.

**Fish Screen at Lower Centerville Diversion and Minimum Instream Flows in Upper Butte Creek and Canal Fish Rescues**

In the draft EA, we did not recommend the 10(j) agencies' recommendations for a fish screen at the Lower Centerville diversion dam, or FWS and Cal Fish & Game's recommendation for minimum instream flow releases from the Butte Creek diversion dam. We did however recommend increasing the minimum instream flow to be released at the Butte Creek diversion dam. Although resident fish populations within project-affected stream reaches are considered to be generally healthy and viable, the project does entrain fish into project works and therefore is likely affecting the overall density of fish populations.

Following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EA, and our attempts to resolve inconsistencies with the section 10(j) recommendations, we found that providing FWS and Cal Fish & Game's recommended minimum instream flow releases from the Butte Creek diversion

dam would cost only about $9,000 annually more than current conditions, compared to our estimate of $31,000 in the draft EA. As such, we no longer find this 10(j) recommendation to be inconsistent with sections 4(e) and 10(a) of the FPA, and the benefits of the additional habitat to the resident trout populations in upper Butte Creek are worth the cost. Therefore, we recommend PG&E provide the agency-recommended minimum instream flows to upper Butte Creek, as discussed in section 5.2.

However, because we continue to conclude that the fish populations in the project-affected stream reaches, including upper Butte Creek, are viable and generally healthy, and we are recommending increased minimum instream flows for the enhancement of the resident fish populations within this stream reach, as well as the implementation of our recommendation for up to two canal fish rescues per year within the Butte and Lower Centerville canals, we continue to find that NMFS' recommendation for installation of a fish screen at the Lower Centerville diversion is not warranted, as discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.

As a result, we find that, while we have resolved the 10(j) recommendations for minimum instream flow releases to upper Butte Creek, the 10(j) recommendations for a fish screen at the Lower Centerville diversion dam remain unresolved.

**Philbrook Creek**

In the draft EA, we recommended that PG&E release a year-round minimum instream flow of 2 cfs in dry and normal water years to Philbrook Creek, as further discussed in section 5.2, *Comprehensive Development and Recommended Alternative,* and did not recommend increasing flows during wet water years. We concluded increasing flows above 2 cfs from Philbrook Creek may compromise the cold water storage within Philbrook reservoir, potentially resulting in increased water temperatures in downstream locations during the warmer summer months.

In the Forest Service's February 26, 2009, comment letter on the draft EA, and during the section 10(j) meetings, additional information was provided regarding Cal Fish & Game and FWS' recommended increase in minimum instream flows for Philbrook Creek during wet water years, as further discussed in section 3.3.2.2, *Aquatic Resources*. We discovered that, during wet water years, Philbrook reservoir often fills to capacity and spills excess water via the spillways. As a result, implementing the agencies' recommended increase in minimum instream flows during wet water years would not compromise cold water storage within the reservoir, contrary to our conclusion in the draft EA.

As further discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, based on the additional information provided, we now recommend, consistent with the agencies' recommendations, that PG&E consult with

the Forest Service, FWS, NMFS, and Cal Fish & Game and release a minimum instream flow of at least 10 cfs to Philbrook Creek between April 1 through May 15, provided ample water is available and PG&E staff can safely access the minimum instream flow release valve at Philbrook dam. We conclude that releasing these increased flows during designated wet water years would reduce downstream erosion created by spill within the Philbrook spillway channel, increase the rainbow trout spawning WUA by approximately 46 percent, and would not sacrifice reservoir storage. Because these flows would normally be lost as spill, there is no cost associated with providing these increased flows. As a result, we consider the preliminary determination of inconsistency with this 10(j) recommendation to be resolved.

**Lower Butte Creek**

In the draft EA, we supported PG&E's proposal to release minimum instream flows downstream of Lower Centerville diversion dam (see table 3-27). We did not support minimum instream flow recommendations from the Forest Service, FWS, NMFS, and Cal Fish & Game. We concluded in the draft EA that implementing our recommended minimum instream flows would provide additional spawning habitat for ESA-listed fish species downstream of Lower Centerville diversion dam, helping to alleviate redd-superimposition and pre-emergent fry mortality. We also concluded that implementing the agency-recommended minimum instream flows would further reduce the average annual project generation by 2.26 GWh and the annual net benefit by approximately $197,000.[85] Therefore, we made a preliminary determination that the agencies' recommendations for minimum instream flows may be inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard section 10(a) of the FPA.

During the section 10(j) meetings, the agencies stated their primary concern was the lack of available spawning habitat for spring-run Chinook salmon downstream of Lower Centerville diversion dam, which the agencies stated could further be increased under their recommended flows (see table 3-27). The agencies believe that their recommended flow would alleviate redd superimposition and pre-emergent fry mortality to a greater extent than would occur under PG&E's proposed and staff-recommended minimum instream flows. Lastly, the agencies stated that releasing their recommended flows from Lower Centerville diversion dam would provide more spawning habitat both upstream and downstream of Centerville powerhouse, allowing salmonids to spread out and better utilize the habitat.

As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, we continue to support the minimum instream flows proposed by PG&E for

[85] See table 4-3 for updated costs pertaining to the agency-recommended minimum instream flows.

lower Butte Creek. We continue to find that implementing these minimum instream flows would increase the spawning habitat for ESA-listed species compared to current conditions and provide conditions that adequately protect the resource. As a result, there is no resolution of this inconsistency.

**Minimum Instream Flows (Feeder Diversions)**

In the draft EA, we supported PG&E's proposal to release minimum instream flows downstream of the feeder diversion dams consistent with existing license requirements (see table 3-3). We did not support minimum instream flow recommendations from Cal Fish & Game and FWS of 0.1 cfs in normal water years and 0.5 cfs in dry water years downstream of the diversion dams on Inskip, Kelsey, Clear, Long Ravine, Cunningham Ravine, and Little West Fork creeks. We concluded that current trout populations both above and below these feeder creek diversion dams were self-sustaining and that the existing minimum instream flows provided good water quality conditions to support resident aquatic organisms.

During the April 13, 2009, section 10(j) meeting, the Forest Service stated that its required/recommended minimum instream flows for the feeder creeks, consistent with those recommended by Cal Fish & Game and FWS, were based not solely on resident fish species, but also on the requirements of foothill yellow-legged frogs, which utilize these creeks as over-wintering areas. The Forest Service stated that, based on some basic estimates of wetted-perimeter, minimum instream flows proposed by PG&E were insufficient and that minimum instream flows of 0.1 cfs, as we recommended in the draft EA for Inskip, Kelsey, Cunningham Ravine, and Little West Fork creeks, during dry water years have been observed to dry up. Also during the section 10(j) meeting, FWS and Cal Fish & Game stated that they would defer to the Forest Service conditions for minimum instream flows in Long Ravine, Cunningham Ravine, and Little West Fork creeks.

As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, we continue to conclude that the minimum instream flows proposed by PG&E, as shown in table 3-3, would provide adequate habitat for aquatic organisms in normal water years, as no information has been provided that indicates otherwise. However, as a result of the information provided by the Forest Service that indicates minimum instream flows of 0.1 cfs may cause the bypassed reaches of these feeder creeks to go dry, we now recommend that minimum instream flows of 0.2 cfs be provided in dry water years downstream of the feeder diversion dams on Inskip, Kelsey, Cunningham Ravine, and Little West Fork creeks. Forest Service modified 4(e) condition 18.1 specifies minimum instream flows for Long Ravine, Cunningham Ravine, and Little West Fork creeks; therefore, because this condition is mandatory, we consider this recommendation for flows in these feeder diversions to be resolved. However, other than the slight modifications to flows noted above, we continue to

support PG&E's proposed minimum instream flows and find that the benefits associated with providing FWS and Cal Fish & Game's recommended flows in Inskip, Kelsey, and Clear creeks do not justify the annualized costs as discussed in section 5.2. As a result of the June 29, 2009, section 10(j) meeting, Cal Fish & Game and FWS, accepted our recommendation for minimum instream flows for Inskip, Kelsey, and Clear creeks, as described above.[86] As a result of the 10(j) meetings, we now consider the inconsistencies associated with all of Cal Fish & Game and FWS' recommendations for minimum flows for each of the feeder creeks to be resolved.

**Resident Fish Population and Benthic Macroinvertebrate Monitoring**

In the draft EA, we did not recommend NMFS, FWS, or Cal Fish & Game's proposal for the frequency or duration of which resident fish population or benthic macroinvertebrate monitoring would occur in Butte Creek and/or the West Branch Feather River. As discussed in the draft EA, while we recommended that PG&E develop resident fish and benthic macroinvertebrate monitoring plans, we did not support the recommendations that sampling be conducted through the term of the license, or at the frequency the 10(j) agencies were recommending. Our analysis in the draft EA found that monitoring the target biota's response to stimuli (change in project operations) for the duration of the license term and at the recommended frequencies is excessive when the response could be observed within 5 years of the change.

However, following review of the agencies' response to our section 10(j) preliminary determination, comments on the draft EA, and during the 10(j) meetings, we note that our draft and final EA recommend the implementation of an adaptive management program for the project. As a result and as discussed in section 3, in this case, monitoring for the duration of the license term would help inform the adaptive management decisions to be made throughout that term.

We still do not support monitoring at the frequency being recommended by the 10(j) agencies. As discussed below, in section 5.4.2, the Forest Service has filed an alternative monitoring frequency. Under this alternative, resident fish populations and benthic macroinvertebrate monitoring would be conducted during the third year of the license and would continue every fifth year thereafter, for the term of the license, or at about half of the frequency of that being recommended by NMFS and FWS.

Monitoring the target biota on a 5-year recurring basis would support a population trend analysis and inform the decision-making process of our recommended adaptive management program. Therefore, as discussed in section 5.2, we now

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[86] See June 29, 2009, section 10(j) meeting transcripts and personal communication from D. Giglio, FWS, to K. Hogan, FERC, filed on July 14, 2009.

recommend that resident fish and benthic macroinvertebrate monitoring be conducted within the West Branch Feather River and Butte Creek for the duration of the license term beginning in year 3 of the license and recurring every fifth year thereafter.

Following the June 29, 2009, section 10(j) meeting, Cal Fish & Game,[87] FWS,[88] and NMFS[89] stated that the frequency and duration of the biotic monitoring discussed was acceptable. As a result, we find that the 10(j) recommendations for resident fish population monitoring and benthic macroinvertebrate monitoring to be resolved.

**Annual Fish Stocking**

In the draft EA, we did not recommend adopting Cal Fish & Game's recommendation for PG&E to annually reimburse Cal Fish & Game for the stocking of 8,000 pounds of trout. As discussed in the draft EA, under a 1983 agreement, PG&E agreed to annually reimburse Cal Fish & Game for the stocking of 14,435 trout, or approximately 7,200 pounds, which would amount to approximately $22,000 at today's cost of production of $3.02 per pound. We found that, although recreation use at the project is estimated to increase about twofold over the next 50 years, fishing license sales in California have been declining in recent years. Therefore, we recommended that, in lieu of annual reimbursement, PG&E develop a fish stocking plan, after consultation with Cal Fish & Game, to include the amount and location of fish to be stocked at DeSabla forebay, Philbrook reservoir, and other affected stream reaches at the project and that PG&E conduct creels surveys through the recreation monitoring to evaluate angler satisfaction, as discussed under *Recreation Monitoring* in section 5.2.

In its comment letter filed on February 27, 2009, Cal Fish & Game requested that we clarify that our recommendation was for the continued stocking of 7,200 pounds of trout into project waters regardless of the cost to raise the fish. During the April 13, 2009, 10(j) meeting, we clarified (as described in section 5.2) that our recommendation was that the poundage of stocked fish called for in the plan should be determined as a result of creel surveys conducted on a 5-year basis, with a goal of maintaining current angler satisfaction. Hence, the number of pounds of fish to be stocked could fluctuate up or down on a 5 year cycle depending on survey results. Further, during the first 5 year cycle, PG&E would be expected to stock 7,200 pounds of trout annually. Upon hearing our clarification, Cal Fish & Game accepted our recommendation for annual

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[87] See June 29, 2009, section 10(j) meeting transcripts.

[88] Personal communication from D. Giglio, FWS, to K. Hogan, FERC, filed on July 14, 2009.

[89] Letter from NMFS filed on July 1, 2009.

fish stocking and we now consider the inconsistencies with this 10(j) recommendation to be resolved.

**Revised Drought Plan**

In the draft EA, we did not recommend adopting recommendations by Cal Fish & Game, FWS, and NMFS for PG&E to implement a revised drought plan once it is filed with the Commission. We concluded that any changes to project operations must first be approved by the Commission prior to implementation by PG&E. Therefore, we made a preliminary determination that agencies' recommendations to implement this revised drought plan, prior to Commission approval, may be inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard section 10(a) of the FPA.

In letters filed February 27, 2009, Cal Fish & Game, NMFS, and FWS stated that their 10(j) recommendations implied PG&E would contact the Commission and the resource agencies simultaneously, file such a plan, and implement upon Commission approval. Further, the agencies stated in their letters that they agreed with Commission staff on this point. Cal Fish & Game, NMFS, and FWS also stated in their February 27, 2009, letter that they concurred with the Commission staff's recommendation in the draft EA for PG&E to notify the Forest Service, Cal Fish & Game, NMFS, FWS, the Water Board, and the Commission by March 15 of the second or subsequent dry water year and to consult with these agencies by May 15 of the same years. Our recommendation slightly modified the dates recommended by the agencies in their 10(j) recommendations, and we note that we incorrectly referenced the wrong dates in our January 14, 2009, preliminary determination of inconsistency letter to the agencies. Upon reviewing the clarifying information submitted by Cal Fish & Game, NMFS, and FWS, we find that the preliminary determination of inconsistency is resolved.

**DeSabla Forebay Water Temperature Improvement Plan**

In the draft EA, we did not recommend adopting recommendations by Cal Fish & Game, NMFS, and FWS that the DeSabla forebay water temperature improvement plan address a reduction in thermal loading within the forebay by at least 80 percent. As discussed in the draft EA, while we supported the portion of this recommendation for PG&E to develop a DeSabla forebay water temperature improvement plan, we did not recommend that this plan address a reduction in thermal loading by 80 percent. We concluded that, based upon PG&E's temperature modeling, the limited additional benefits of developing and implementing a plan to construct a facility that would reduce thermal loading by 80 percent did not justify an annualized cost of approximately $201,100 more than a facility which reduces thermal loading by 50 percent. Therefore, we made a preliminary determination that the agencies' recommendations for a facility with an 80 percent reduction in thermal loading may be inconsistent with the public

interest standard of section 4(e) and the comprehensive planning standard section 10(a) of the FPA.

In letters filed February 27, 2009, and during the section 10(j) meetings, Cal Fish & Game, NMFS, and FWS modified their 10(j) recommendations regarding this issue. Instead of the 80 percent reduction criteria, the agencies now recommend that thermal loading in the forebay be reduced by constructing and operating a pipe to transport water from the terminus of Butte canal to the intake of DeSabla forebay, effectively allowing the water to bypass the forebay. The agencies stated that installation of such a pipe would be the most efficient option to reduce thermal loading within the forebay, be more cost effective than other options, and eliminate the uncertainty associated with requiring PG&E to meet specific percent thermal loading reduction targets. PG&E also stated during the section 10(j) meetings that it now proposes to pursue this option.

As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, we modified our recommendation to support the agencies' revised recommendation for PG&E to construct and operate a pipe to reduce thermal loading within the forebay. Further, because Cal Fish & Game, NMFS, and FWS have modified their 10(j) recommendation to no longer include specific reduction levels in thermal loading, we conclude that our preliminary determination of inconsistency for this recommendation is resolved.

**Install and Maintain up to Three Additional Streamflow Gages**

In the draft EA, we did not support recommendations by Cal Fish & Game that, over the term of the license, up to three additional streamflow gages may be required based on the outcome of annual consultation. As discussed in the draft EA, we were unable to analyze this recommendation because Cal Fish & Game did not specify where these gages would be located nor provide any justification for the necessity of these three additional gages. We concluded that the installation, operation, and maintenance of three additional streamflow gages would have a total annualized cost of $51,100 and that the minimal benefits would not justify the costs. Therefore, we made a preliminary determination that Cal Fish & Game's recommendation for these three additional streamflow gages may be inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard section 10(a) of the FPA.

Cal Fish & Game, in its letter filed February 27, 2009, clarified this recommendation. Cal Fish & Game stated that this recommendation was meant to address adaptive management, and acknowledged that the exact costs or locations of these potential gages are therefore unknown. Cal Fish & Game further stated its main concern was that if it becomes necessary or prudent to have additional streamflow gages to evaluate changes in project operations that may occur, unless the need for these gages is called out in a license term, the Commission may not require them. However, Cal

Fish & Game stated that if these gages are incorporated as part of the adaptive management program, this would be an acceptable alternative.

At the section 10(j) meetings, we stated that having a provision included in the adaptive management program to address the need for these streamflow gages, as suggested by Cal Fish & Game, would be an acceptable alternative, as further discussed in section 5.2, *Comprehensive Development and Recommended Alternative*. Therefore, based upon the additional information and reanalysis in this final EA, we recommend that the need for these three streamflow gages be addressed in the adaptive management program. As a result, we consider the preliminary determination of inconsistency with this 10(j) recommendation to be resolved.

**Remote Operating Capability/Reservoir Gages**

In the draft EA, we did not recommend adopting NMFS' recommendation for PG&E to install remote operating equipment at Round Valley and Philbrook reservoirs. We concluded that the staff alternative included numerous measures such as the installation of a real-time water temperature and reservoir level gage in Philbrook reservoir, as well as modifying, constructing, and operating additional streamflow gages in important project bypassed reaches, which would better enable the project to operate based on changes in environmental conditions for the benefit of aquatic resources than under existing conditions. We concluded that, although having the capability to remotely operate the two project reservoirs would likely allow for changes in project operations to occur more quickly, there was little evidence to support the need for remote operation of these two project reservoirs. We estimated that the annualized cost of installing this remote operating equipment at these two reservoirs would cost $20,500, and that the minimal benefits did not justify these costs. For these reasons, we made a preliminary determination that the recommendation to install this remote operating equipment may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

In the draft EA, we also did not recommend adopting NMFS' recommendation for PG&E to install a real-time water temperature, reservoir elevation and flow gage in Round Valley reservoir. We concluded that Round Valley reservoir is dry for much of the year and that there is little to no project-related reservoir level management once releases begin in late-spring to early-summer. We estimated that the annualized cost of installing, operating, and maintaining this equipment in Round Valley reservoir would cost $17,000, and that the minimal benefits did not justify these costs. Therefore, we made a preliminary determination that these recommendations may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

During the section 10(j) meetings, NMFS stated that its main concern was PG&E's ability to quickly respond to heat events and increase flows from Philbrook reservoir during summer months. During the 10(j) meetings, PG&E stated that in the summer, adjustments to the valve releasing water from Philbrook reservoir are usually done in consultation with the resource agencies and that adjustments to the release valve can be accomplished within 2 hours. NMFS stated during the section 10(j) meetings that is withdrew this 10(j) recommendation based upon PG&E's clarification that a rapid response is possible during the summer months, if weather conditions dictate. Therefore, we consider the preliminary determination of inconsistency with this 10(j) recommendation to be resolved.

**Streamflow Gages (Feeder Creeks)**

In the draft EA, we did not support recommendations by FWS for new flow gaging stations to be installed downstream of the following feeder diversion dams: Inskip, Kelsey, Clear, Helltown Ravine, Long Ravine, Cunningham Ravine, Little West Fork, and Little Butte creeks. We concluded in the draft EA that current minimum instream flows are made from the project feeder diversion dams via 3- to 4-inch-diameter pipes at the base of the diversion dams with roving operators used to monitor and maintain these diversions on a weekly basis. We further concluded that the project feeder creeks are in high gradient areas, which could make the installation of stream gages difficult, and that calibrating stream gages in such environments would also be difficult given the rough channel characteristics and topography, which may result in large amounts of uncertainty, possibly making accurate stream flow estimates difficult. We also noted that PG&E proposes to remove the diversion dam on Little Butte Creek since it has not been in use for many years, eliminating the need for an instream flow gage to monitor compliance. We estimated the total annualized cost of constructing, installing, and maintaining these eight stream flow gages to be about $94,860 and that the minimal benefits associated with constructing and operating these stream flow gages did not justify the costs. For these reasons, we found that this recommendation for these streamflow gages may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

In lieu of installing stream gages, we recommended in the draft EA that PG&E continue to use roving operators to monitor and maintain these feeder diversions on a weekly basis. We concluded that this would ensure any required minimum instream flow releases would continue to be made and that the pipelines supplying minimum instream flows do not become blocked with debris. We estimated the total annualized cost of using a roving operator to maintain these facilities would be $20,000 and that the benefits justified these costs.

FWS in a letter filed February 27, 2009, acknowledged that these feeder diversions are designed such that any water in excess of the required minimum instream

flows cannot be diverted and remains within the bypassed reach. FWS further stated that it accepts the Commission staff's recommendation for PG&E to use roving operators to ensure minimum instream flows would be released downstream of the respective diversion dams. Therefore, we consider the preliminary determination of inconsistency with this 10(j) recommendation to be resolved.

**Foothill Yellow-legged Frog Monitoring**

In the draft EA, we did not recommend adopting portions of FWS' foothill yellow-legged frog monitoring plan. While we recommended that PG&E develop a foothill yellow-legged frog monitoring plan, we do not adopt the monitoring frequency of every 3 years after an initial 10-year monitoring period. We found that our recommended monitoring frequency of 3 consecutive years after the issuance of the license, then every 5 years thereafter would be sufficient to identify any potential adverse effects on foothill yellow-legged frog populations as a result of recommended changes in flows, ramping rates, and water temperature changes and could provide a timely mechanism to implement project operational changes to benefit this species.

We estimated that the annualized cost of implementing FWS' foothill yellow-legged frog monitoring plan to be $110,000, which would be $59,600 more than the annualized cost of our recommended plan. For these reasons, we found that these portions of the recommended plan may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA.

Although the FWS alternative does reduce the number of surveys, and thus the annual cost ($61,500 compared to staff alternative cost of $49,600 based on revised costs), there is not sufficient information to justify the more frequent surveys (see section 5.2.2), particularly four surveys conducted annually at the end of the license term as discussed below, and the additional costs. However, we did modify our recommendation to require annual monitoring for the first 4 years (rather than just the first 3 years). Therefore, there still is no resolution of the yellow-legged frog monitoring issue.

A significant difference between the FWS and staff recommendations is the 4 years of monitoring recommended prior to the next relicense period. As discussed in section 5.2.2, we do not find that it is appropriate to conduct studies for the next relicensing as part of any new license for this project. Further, this aspect of the recommendation is not subject to section 10(j) because the recommended monitoring is not tied to any protection, mitigation, or enhancement measures related to the license under consideration.

We also did not recommend adopting FWS' recommendation for PG&E to develop a population model linking various life stage data; relate egg mass counts

quantitatively to adult population size or overall population growth rate; conduct a population viability analysis; and determine the species-specific effects of temperature on development rates of embryos and larvae, growth rates of tadpoles, and size at metamorphosis ($1.75 million as estimated by PG&E). These measures are not within the scope of section 10(j) because they are not specific measures to protect, mitigate, or enhance fish and wildlife resources. As discussed in section 5.2.2, we found that, although these recommendations could enhance conservation efforts for the foothill yellow-legged frog, they are in excess of what is needed to monitor changes in project operations and not necessary to determine the presence of project-related effects. We determined that our recommended population monitoring would be sufficient to determine trends in numbers of egg masses, foothill yellow-legged frog distribution, suitability of breeding and rearing habitat, and level of recruitment. We find that the need for more focused studies would be best determined based on monitoring results.

**Bald Eagle Management Plan**

In the draft EA, we did not recommend bald eagle monitoring every year as recommended by FWS. We instead recommended, given the current, limited use of the project area by eagles and the limited potential of impacts from recreation use or maintenance activities, monitoring every 3 years, along with incidental observations (see section 5.2.2). We also recommended that the plan provide for more frequent surveys if observations of eagles become more common. We did not find that the benefits of the FWS recommendation were worth the additional cost. For these reasons, we found that the recommendation for more frequent monitoring may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA. FWS accepted the staff alternative. Therefore, we consider the preliminary determination of inconsistency with this 10(j) recommendation to be resolved.

Table 5-2. Fish and wildlife agency recommendations for the DeSabla-Centerville Hydroelectric Project. (Source: Staff, 2009)

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Project canal maintenance and inspection plan | FWS | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $152,570 | Yes |
| Maintenance of canal wildlife protection facilities and monitor wildlife loss in project canals | FWS, Cal Fish & Game | Yes | $9,600 | Yes |
| Summary report of wildlife mortalities in canals | Cal Fish & Game | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $100 | Yes |
| Foothill yellow-legged frog monitoring plan | FWS | Yes | $61,500 | Not adopted; however, we do recommend a monitoring plan with a different monitoring schedule (see section 5.2.2) |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Foothill yellow-legged frog population modeling, viability analysis, temperature effects study, and relationship between discharge and stage | FWS | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $39,700 | Not adopted (see section 5.2.2) |
| Federally listed species protection and management | FWS | No. Measure dependent on future undefined actions | Unknown | Yes |
| Federally listed species annual consultation | FWS | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $5,000 | Yes |
| Bald eagle management plan | FWS | Yes | $4,500 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| VELB Management Plan | FWS | Yes | $4,800 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Invasive/noxious weed and vegetation management plan | FWS | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $51,800 | Yes |
| Fish screening of Lower Centerville diversion | NMFS, Cal Fish & Game, FWS | Yes | $537,500 | Not adopted[a] (see sections 5.2.2 & 5.4.1). |
| Canal fish rescue plan and implementation | NMFS, FWS, Cal Fish & Game | Yes | $42,900 | Yes |
| Fish screening at Hendricks diversion dam | FWS, Cal Fish & Game | Yes | $205,400 | Yes |
| Fish ladder at Hendricks diversion dam | FWS, Cal Fish & Game | Yes | $131,700 | Yes |
| Maintain a minimum pool at Philbrook reservoir of 250 acre-feet | FWS | Yes | $1000 | Yes |
| Resident fish monitoring in all project-affected stream reaches and reservoirs. Monitoring in years 1, 2, 5, 6, 10, 11, 15, 16, 20, 21, 25, and 26 | FWS | Yes | $88,700 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Resident fish monitoring in Butte Creek. Monitoring in years 1, 2, 5, 6, 10, 11, 15, 16, 20, 21, 25, and 26 | NMFS | Yes | $32,500 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| Annually monitor the federally listed spring-run Chinook salmon and the Central Valley steelhead in Butte Creek | NMFS, FWS, Cal Fish & Game | Yes | $139,700 | Yes |
| Monitor movement patterns of adult Chinook salmon in response to changes in project flows, and the monitoring of Chinook salmon holding habitat | Cal Fish & Game | Yes | $3,400 | Yes. |
| Benthic macroinvertebrate monitoring in project-affected bypassed reaches in years 1 through 4, and 8, 12, 16, 20, 24, and 29 | NMFS, FWS, Cal Fish & Game | Yes | $55,300 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| Long-term operations plan | FWS, NMFS, Cal Fish & Game | Yes | $6,900 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Comprehensive monitoring report with adaptive management summary | Cal Fish & Game | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $3,400 | Yes |
| Annually stock 8,000 pounds of trout for put-and-take fishery | Cal Fish & Game | Yes | $24,000 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| Measure minimum instream flows as the 24-hour average and as instantaneous flow, as required by USGS | FWS, NMFS, Cal Fish & Game | Yes | $0 | Yes |
| The minimum instantaneous 15-minute stream flow shall be at least 80 percent of the prescribed mean daily flow for stream flows less than or equal to 10 cfs and at least 90 percent for minimum instream flows required to be greater than 10 cfs | FWS, NMFS | Yes | $0 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| If mean daily flows are less than the required mean daily flow, but more than the instantaneous flow, begin releasing the equivalent under-released volume of water within 7 days of discovery | FWS, NMFS | Yes | $0 | Yes |
| Instantaneous flows may deviate below the specified minimum instream flow releases by up to 10 percent, or 3 cfs, whichever is less | FWS, NMFS | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $0 | Yes |
| Promptly resume performance of flow requirements after an emergency and notify the resource agencies within 48 hours, and provide notice to the Commission as soon as possible, but no later than 10 days after each incident with an explanation | FWS, NMFS, Cal Fish & Game | Yes | $0 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Complete facility modifications needed for the releases of minimum instream flows as soon as possible, but no longer than 3 years after license issuance | FWS, NMFS, Cal Fish & Game | Yes | $0 | Yes |
| Implement a revised drought operational plan | FWS, NMFS, Cal Fish & Game | Yes | $0 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| Determine water year types based on the California Department of Water Resources Bulletin 120 | FWS, NMFS, Cal Fish & Game | Yes | $0 | Yes |
| Provide notice to the resource agencies and the Commission within 30 days of making the final water year type determination | FWS, NMFS, Cal Fish & Game | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $0 | Yes |
| Implement ramping rates based on water velocity and stage in foothill yellow-legged frog breeding areas | FWS | Yes | $0 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| During upramping downstream of Lower Centerville diversion dam, velocity should not change more than 0.2 foot per second per hour | NMFS | Yes | $0 | Yes |
| In consultation with the resource agencies, review information from fish and foothill yellow-legged frog monitoring to determine the need to adjust ramping rates, and file with the Commission any proposed adjustments | FWS | Yes | $500 | Yes |
| Implement agency-recommended minimum instream flows in lower West Branch Feather River | FWS, Cal Fish & Game | Yes | $470,400 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| Implement agency-recommended minimum instream flows in upper Butte Creek | FWS, Cal Fish & Game | Yes | $8,700 | Yes |
| Implement agency-recommended minimum instream flows in lower Butte Creek | NMFS, FWS, Cal Fish & Game | Yes | $383,300 | Not adopted (see section 5.2.2) |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Implement agency-recommended minimum instream flows in Philbrook Creek | FWS, Cal Fish & Game | Yes | $0 | Yes |
| Implement agency-recommended minimum instream flows downstream of Round Valley reservoir | FWS, Cal Fish & Game | Yes | $0 | Yes |
| Release a minimum instream flow of 1 cfs in normal water years and 0.5 cfs in dry water years downstream of Inskip, Kelsey, Clear and Helltown Ravine diversion dams | FWS | Yes | $276,000 | Yes, as revised pursuant to section 10(j) process (see sections 5.2 and 5.4.1). |
| Release a minimum instream flow of 1 cfs in normal water years and 0.5 cfs in dry water years downstream of Long Ravine, Little West Fork, and Cunningham Ravine diversion dams | FWS, Cal Fish & Game | Yes | $113,200 | Not adopted; however, we consider this recommendation to be resolved as it is consistent with Forest Service 4(e) conditions. |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Flows discharged downstream of Hendricks diversion dam shall be maintained within the West Branch Feather River to the high water line of Lake Oroville | Cal Fish & Game | Yes | $0 | Not enforceable (see section 5.2.2). |
| Make a good faith effort to ensure minimum instream flows downstream of Hendricks diversion dam are not diverted from the West Branch Feather River through methods under the control of PG&E | Cal Fish & Game | Yes | $0 | Not enforceable (see section 5.2.2). |
| Consult with the resource agencies to identify water rights associated with diversion of water from the West Branch Feather River | Cal Fish & Game | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $500 | Not adopted (see section 5.2.2). |
| Develop and implement a feeder diversion facility removal plan | FWS | Yes | $13,700 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Remove the feeder diversions on Oro Fino Ravine, Emma Ravine, Coal Claim Ravine, Stevens, and Little Butte creeks | Cal Fish & Game | Yes | $13,700 | Yes |
| Develop and implement a DeSabla forebay water temperature improvement plan to include the installation of a pipe | FWS, NMFS, Cal Fish & Game | Yes | $744,900 | Yes |
| Develop and implement a water temperature monitoring plan | FWS, NMFS | Yes | $29,000 | Yes |
| Install and maintain a flow data logger downstream of Hendricks diversion dam, a real-time flow gaging station upstream of Butte Creek diversion dam, and modify the existing stream gage near Lower Centerville dam for real-time access | FWS, Cal Fish & Game | Yes | $37,400 | Yes |

| Recommendation | Agency | Within Scope of Section 10(j)? | Annualized Cost | Adopted? and Basis for Preliminary Determination of Inconsistency |
|---|---|---|---|---|
| Operate and maintain the existing streamflow gages downstream of Round Valley reservoir and Hendricks diversion dam | FWS | Yes | $6,600 | Yes |
| Install and maintain a new stream gage with real-time capability downstream of the confluence of the low level release and the spill channel in Philbrook Creek | FWS | Yes | $17,000 | Yes |
| Install and maintain up to 3 additional streamflow gages, if deemed necessary as a result of annual consultation with the resource agencies | Cal Fish & Game | Yes | $0 | Yes, as resolved pursuant to section 10(j) process (see sections 5.2.2 and 5.4.1). |
| Measure and document all minimum instream flow releases in publicly available and readily accessible formats and provide flow data to USGS in an annual report | FWS, Cal Fish & Game | No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. | $2,500 | Yes |

[a] Preliminary finding that the recommendations found to be within the scope of 10(j) are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, are

based on staff's determination that the costs of the measures outweigh the expected benefits.

### 5.4.2 Land Management Agencies' Section 4(e) Conditions

In section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*, we list the preliminary 4(e) conditions submitted by BLM and the modified 4(e) conditions submitted by the Forest Service, and note that section 4(e) of the FPA provides that any license issued by the Commission "for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation." Thus, any 4(e) condition that meets the requirements of the law must be included in any license issued by the Commission, regardless of whether we include the condition in our staff alternative.

Of the Forest Service's 36 modified conditions, we consider 18 of the conditions (conditions 1 through 17 and 27) to be administrative or legal in nature and not specific environmental measures. Therefore, we do not analyze these conditions in this EA. Of BLM's 22 revised preliminary conditions, we consider 18 of the conditions (conditions 1 through 17 and 22) to be administrative or legal in nature and not specific environmental measures. Therefore, we do not analyze these conditions in this EA.

On June 11, 2009, the Forest Service filed a letter with the Commission in response to our revised recommendations issued on May 22, 2009, and discussed above in section 5.4.1. In its letter, and during the June 29, 2009, section 10(j) meeting, the Forest Service identified several 4(e) conditions that it would modify or withdraw to allow consistency between its modified 4(e) conditions and the 10(j) recommendations resolved between Commission staff and FWS and Cal Fish & Game. We identify these 4(e) conditions in table 5-3.

Table 5-3 summarizes our conclusions with respect to the each of the agencies' 4(e) conditions that we consider to be environmental measures. In the staff alternative, we include 15 conditions as specified by the agencies, 12 from the Forest Service and 3 from BLM; modify 4 of the Forest Service conditions to adjust the scope of the measure; and do not recommend 3 conditions, 2 from the Forest Service and 1 from BLM. The measures we modify or do not adopt in total are discussed in more detail in section 5.2, *Comprehensive Development and Recommended Alternative*.

Table 5-3. Modified section 4(e) conditions filed by the Forest Service and preliminary section 4(e) conditions submitted by BLM for the DeSabla-Centerville Hydroelectric Project. (Source: Staff)

| Condition | Annualized Cost | Adopted? |
|---|---|---|

| Condition | Annualized Cost | Adopted? |
|---|---|---|
| **Forest Service Modified 4(e) Conditions** | | |
| No. 18: Streamflow | $553,000[a] | No. We recommend maintaining the current minimum instream flows downstream of the Hendricks diversion dam,[a] and within the feeder creeks. However, during dry years, we recommend the Forest Service's minimum instream flow (0.2 cfs) be released to the feeder creeks as discussed in section 5.2. Additionally, we adopt the Forest Service's required flows for downstream of Round Valley and Philbrook reservoir dams. |
| No. 18: Water Year Type | $0 | Yes |
| No. 18: Multiple Dry Water Years | $500 | Yes |
| No. 18: Streamflow Measurement | $26,100 | Yes |
| No. 18: Instream Flow-Ramping Rate Study | $12,800 | Yes |
| No 19: West Branch Feather River Rainbow Trout Monitoring | $26,200 | No. However, the Forest Service indicated it will withdraw this 4(e) recommendation in its letter filed June 11, 2009, and pursuant to the section 10(j) process (see sections 5.2 and 5.4.1). |
| No. 20: Resident Fish Monitoring Plan for the West Branch Feather River | $19,400 | Yes. However, we recommend an alternative to the duration, frequency, and location of the monitoring, consistent with the Forest Service's letter filed on June 11, 2009. |
| No. 20: Amphibian Monitoring | $37,600 | Yes. However, we find that PG&E's monitoring schedule (annually for first 3 years and |

| Condition | Annualized Cost | Adopted? |
|---|---|---|
| | | every 5 years thereafter) would be sufficient. |
| No. 20: Benthic Macroinvertebrate Monitoring | $55, 300 | Yes. However, we recommend an alternative to the duration, frequency, and location of the monitoring, consistent with the Forest Service's letter filed on June 11, 2009. |
| No. 21: Stabilize the Round Valley Spillway Channel | $480,000 | Yes |
| No. 22: Stabilize the Philbrook Spillway Channel | $480,000 | Yes |
| No. 23: Project Canal Maintenance and Inspection | $15,000 | Yes |
| No. 24: Long-term Operations Plan | $6,900 | Yes |
| No. 25: Maintain Minimum Pool in Philbrook reservoir | $1,000 | Yes |
| No. 26: Special Status Species | $1,250 | Yes |
| No. 28: Canal Wildlife Crossing or Escape Facilities | $9,600 | Yes |
| No. 29: Monitor Animal Losses in Project Canals | $100 | Yes |
| No. 30: VELB Protection | $1,900 | Yes |
| No. 31: Vegetation and Invasive Weed Management | $20,000 | Yes |
| No. 33: Recreation Facilities on or affecting National Forest System Land | $126,050 | Yes. However, we recommend an alternative to the amount of facility upgrades and the duration and frequency of the monitoring. |
| No. 34: Land Resource Plans | $4,800 | Yes |
| No. 35: Heritage Properties Management Plan | $30,000 | Yes |
| No. 36: Project Transportation | $20,300 | Yes. However, we recommend an |

| Condition | Annualized Cost | Adopted? |
|---|---|---|
| System Management Plan | | alternative to the duration and frequency of the monitoring. |
| **BLM Revised Preliminary 4(e) Conditions** | | |
| No. 18: Recreation Use and Reporting | $15,000 | Yes |
| No. 19: Funding to Address Patrol and Maintenance | $30,000 | No |
| No. 20: Maintenance of Portion of Ditch Creek Road | $1,000 | Yes |
| No. 21: Control of Erosion | $15,000 | Yes |

[a] During the June 29, 2009, section 10(j) meeting, the Forest Service indicated that it would amend its 4(e) condition for minimum instream flows below the Hendricks diversion dam to be consistent with our recommended flows that resulted from the 10(j) process, as discussed in section 5.4.1.

## 5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C.§ 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or

waterways affected by the project. We reviewed 14 comprehensive plans[90] that are applicable to the DeSabla-Centerville Hydroelectric Project and found no inconsistencies. However, during the April 13, 2009, section 10(j) meeting, Cal Fish & Game stated that our recommendation in the draft EA was inconsistent with the Steelhead restoration and management plan for California. For reasons discussed below, we disagree.

The Steelhead restoration and management plan for California (plan) identifies two goals: (1) to increase natural production, and (2) to enhance angling opportunities

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[90] California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance: 1988 annual report. Sausalito, CA. 84 pp. California Department of Fish and Game. U.S. Fish and Wildlife Service. National Marine Fisheries Service. Bureau of Reclamation. 1988. Cooperative agreement to implement actions to benefit winter-run Chinook salmon in the Sacramento River Basin. Sacramento, CAA. May 20, 1988. 10 pp. and exhibit. California Department of Fish and Game. 1990. Central Valley salmon and steelhead restoration and enhancement plan. Sacramento, CA. April 1990. 115 pp. California Department of Fish and Game. 1993. Restoring Central Valley streams: A plan for action. Sacramento, CA. November 1993. 129 pp. California Department of Fish and Game. 1996. Steelhead restoration and management plan for California. February 1996. 234 pp. California Department of Parks and Recreation. 2003. Public opinions and attitudes on outdoor recreation in California 2002, An Element of the California Outdoor Recreation Planning Program. California State Parks. Sacramento, CA. California Department of Parks and Recreation. 2002. California outdoor recreation plan-2002. Sacramento, CA. 154 pp. and appendices. California Department of Water Resources. 1994. California water plan update. Bulletin 160-93. Sacramento, CA. October 1994. Two volumes and executive summary. California Department of Water Resources. 2000. Final programmatic environmental impact statement/environmental impact report for the CALFED Bay-Delta Program. Sacramento, CA. July 2000. Three volumes and CD Rom. California State Water Resources Control Board. 1975. Water quality control plan report. Sacramento, CA. Nine volumes. California - The Resources Agency. 1989. Upper Sacramento River Fisheries and Riparian Habitat Management Plan. Sacramento, CA. January 1989. 158 pp. Forest Service. 1992. Lassen National Forest land and resource management plan, including Record of Decision. Department of Agriculture, Susanville, California. Appendices and maps. State Water Resources Control Board. 1999. Water Quality Control Plans and Policies Adopted as Part of the State Comprehensive Plan. April 1999. Three enclosures. U.S. Fish and Wildlife Service. California Department of Fish and Game. California Waterfowl Association. Ducks Unlimited. 1990. Central Valley habitat joint venture implementation plan: a component of the North American waterfowl management plan. Department of the FWS, Portland, OR. February 1990. 102 pp.

and non-consumptive uses. To help achieve these goals, the plan identifies the four actions listed below, to help restore steelhead and salmon in Butte Creek:

- assure an adequate water supply to lower reaches;
- modify or construct adequate fishways and provide adequate screens for diversions;
- correct water temperature and agricultural drain problems; and
- implement habitat restoration work in lower Butte Creek, such as sediment control and revegetation of stream banks.

In addition, the plan specifies that the Butte Creek Head and Lower Centerville diversion dams be modified to provide fish passage, allowing steelhead access to the Butte Creek canyon and headwaters.

However, the plan fails to recognize the presence of a 35-feet-high natural barrier to fish passage located 0.58 mile upstream of the Lower Centerville diversion dam. As discussed in section 3, providing upstream passage at the Lower Centerville diversion dam would not allow steelhead to access the upstream Butte Head dam or any stream reaches above the natural barrier, including Butte Creek headwaters. Therefore, as discussed in section 5.2, we do not recommend fish passage at the Lower Centerville diversion or Butte Head dam. Because we do not recommend such passage facilities and steelhead will not have access to Butte Creek headwaters, providing fish screens at these locations will not benefit the ESA-listed population of steelhead (*O. mykiss*).

Alternatively, we are recommending, as discussed in section 5.2: (1) an increase in the minimum instream flow releases made at the Lower Centerville diversion dam, providing greater habitat for spawning salmon and steelhead; (2) the installation of the DeSabla Forebay Water Temperature Improvement facility, to reduce water temperatures in the anadromous reach of Butte Creek; and (3) providing flexibility in project operations through our recommendation for an annual project operations and maintenance plan, allowing the jurisdictional agencies and PG&E to operate the project to provide additional cold water to the anadromous reach of Butte Creek to protect salmon and steelhead during heat storms.

Therefore, because of the natural barrier in Butte Creek that prevents steelhead access to Butte Creek headwaters, and with additional measures that we recommend for increasing habitat, reducing water temperatures, and providing additional protections during heat storms, we find that our recommendation is consistent with the overall goal of the Steelhead restoration and management plan for California to increase natural production and to enhance angling opportunities and non-consumptive uses.

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# 6.0 FINDING OF NO SIGFICANT IMPACT

Continuing to operate the DeSabla-Centerville Hydroelectric Project, with our recommended measures, would involve minimal land-disturbing or land-clearing activities. Our recommended measures would protect water quality, provide cold water to support the federally listed Chinook salmon and steelhead trout, increase minimum stream flows to project-affected stream reaches, and provide recreational opportunities at project reservoirs. Project operation and the associated fish and deer entrainment into project canals would result in some minor, long-term effects on resident fish from Butte Creek and the West Branch Feather River. Providing the canal fish rescues would help minimize the effects on the fishery. Deer and other mammals would continue to be entrained into and have their habitat segmented by the project's canals. Maintaining the canal bridge crossings and escapement facilities would help limit these effects.

On the basis of our independent analysis, we find that the issuance of a license for the DeSabla-Centerville Hydroelectric Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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# APPENDIX A

## Draft License Articles

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# APPENDIX A

# DRAFT LICENSE ARTICLES

## I. MANDATORY CONDITIONS

Of the Forest Service's and the Bureau of Land Management's preliminary 4(e) conditions (described in section 2.2.4 of the EA) we include in the staff alternative 15 conditions as specified by the agencies, 12 from the Forest Service and 3 from BLM, modify four of the Forest Service conditions to adjust the scope of the measures, and did not recommend three conditions, two from the Forest Service and one from BLM; the measures we modify or do not adopt in total are discussed in more detail in section 5.2, Comprehensive Development and Recommended Alternative. However, we recognize that the Commission is required to include valid section 4(e) conditions in any license issued for the project.

Under the staff alternative with mandatory conditions, each of the measures that staff recommend's be modified or does not recommend at all would be added to the Staff Alternative. Incorporation of these mandatory conditions into a new license would cause us to modify or eliminate some of the environmental measures that we include in the Staff Alternative. Our recommendations for: water temperature and aquatic biota monitoring in the West Branch Feather River, minimum instream flows at Hendricks's diversion dam, and recreation facilities on National Forest System lands would no longer be necessary given the Forest Service provides a counter part measure in their 4(e) conditions to our recommended measure.

As a result, the following provides the draft environmental license articles staff would recommend in addition to the mandatory conditions.

## II. ADDITIONAL LICENSE ARTICLES RECOMMENDED BY COMMISSION STAFF

We recommend including the following license articles for any license issued for the project:

Draft Article 4xx. *Minimum Instream Flows*. Within 90 days of license issuance, the licensee shall release the minimum instream flows downstream of Butte Creek diversion dam, Lower Centerville diversion dam, and Inskip, Kelsey, Clear, and Helltown Ravine creeks, as specified in the table below.

| Point of Discharge | Minimum Instream Flow Requirement by Water Year (in cfs) | | Time Period |
|---|---|---|---|
| | Normal | Dry | |
| Butte Creek diversion dam | 30 | 20 | March 1-May 31 |
| | 16 | 10 | June 1-February 28/29 |
| Lower Centerville diversion dam | 75 | 60 | September 15-January 31 |
| | 80 | 75 | February 1-April 30 |
| | 80 | 65 | May 1-May 31 |
| | 40 | 40 | June 1-September 14 |
| Inskip Creek | 0.25 | 0.20 | Year-round |
| Kelsey Creek | 0.25 | 0.20 | Year-round |
| Clear Creek | 0.5 | 0.25 | Year-round |
| Helltown Ravine Creek | 1.0 | 0.5 | Year-round |

The interim minimum flow may be temporarily modified if required by operating emergencies beyond the control of the licensee, or for short periods upon agreement between the licensee, the California Department of Fish and Game (Cal Fish & Game), National Marine Fisheries Service (NMFS), and the Fish and Wildlife Service (FWS). If the required minimum flow is so modified, the licensee shall notify the Commission, Cal Fish & Game, NMFS, and the FWS as soon as possible, but not later than 10 days, after each such occurrence.

Draft Article 4xx. *Feeder Creek Diversion Removal Plan*. Within 1 year of license issuance, the licensee shall file with the Commission for approval a Feeder Creek Diversion Facility Removal Plan. This plan shall include schedules, site plans, and mitigation measures for the removal of feeder diversion facilities on Stevens, Oro Fino, Emma Ravine, Coal Claim Ravine, and Little Butte creeks.

The licensee shall develop the plan after consultation with the FWS, Cal Fish & Game, Forest Service, the Water Board, and NMFS. The licensee shall include with the plan documentation of agency consultation, copies of comments and recommendations made in connection with the plan, and a description of how the plan accommodates the comments and recommendations of the agencies. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the

plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that it has been approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Water Quality Monitoring*. The licensee shall conduct water quality monitoring in receiving streams prior to, during, and after returning project canals to service. Sampling shall occur within 24 hours of taking the canal out of service, once in the middle of the canal outage, and within 24 hours of placing the canal back into service. Routine monitoring shall include sampling water quality in the receiving stream at one site upstream and downstream of the location the canal discharges water into the stream. Monitoring parameters will include water temperature, dissolved oxygen, and turbidity sampled at regular intervals. In the event that herbicides are used along project canals, the licensee shall include herbicide sampling with the routine monitoring parameters listed above. Laboratory analysis shall include the herbicide's active ingredients and any degradation byproducts associated with aquatic toxicity in the herbicides used. Licensee shall provide a summary of cleaning and maintenance activities as well as the monitoring results to the Water Board, and file the summary report with the Commission within 30 days of completing the monitoring and any associated laboratory analysis.

Draft Article 4xx. *Ramping Rate Plan*. To protect aquatic habitat downstream of Butte Creek and Lower Centerville diversion dams when the Butte or Lower Centerville canals are brought on- or off-line, or in instances when the project changes between required minimum instream flow releases, the licensee shall ramp controllable flows based upon the following criteria. If sufficient water is not available to hold stream stage levels constant during periods when foothill yellow-legged frog egg masses are present, the flow releases shall be based on combined conditions of water velocity and stage in breeding areas, such that: (1) if eggs are laid at a high flow level, then during down-ramping (fall), stage changes shall not occur at a rate greater than 0.2 feet per second per hour at the egg mass site and water levels shall not drop to the extent that more than 20% of egg masses are de-watered; (2) during up-ramping (rise), velocity shall not change more than 0.2 feet per second per hour and shall not exceed 0.8 feet per second at the most sensitive egg mass site; and (3) when foothill yellow-legged frog tadpoles or juveniles are present, the up and down ramping rate shall be 0.4 feet per second per hour or less and shall not exceed 1.0 foot per second at the site. The licensee shall also schedule canal outages as early in the year as possible to avoid the foothill yellow-legged frog breeding and rearing season, and to avoid changes in releases at these diversions during critical times in the life history of foothill yellow-legged frog.

Within 1 year of license issuance, the licensee shall file a Ramping Rate Plan with the Commission for approval. This plan should address methodologies for determining the relationship between project operations at the diversion dams (Butte Creek and Lower Centerville diversion dams) and how downstream water velocities at the aforementioned locations are affected, and how compliance of these ramping rates will be achieved. This plan shall also provide for consultation with Forest Service, Cal Fish & Game, NMFS, and the FWS to review foothill yellow-legged frog population monitoring results to determine if the ramping rate criteria specified above is protective of this species or if there is a need to potentially modify these ramping rates. Any revised ramping rates would need to be filed with the Commission for approval prior to implementation.

The licensee shall develop the plan after consultation with the Forest Service, FWS, Cal Fish & Game, and NMFS. The licensee shall include with the plan documentation of agency consultation, copies of comments and recommendations made in connection with the plan, and a description of how the plan accommodates the comments and recommendations of the agencies. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that it has been approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *DeSabla Forebay Water Temperature Improvement Plan.* Within two years of license issuance, the licensee shall file with the Commission for approval a DeSabla Forebay Water Temperature Improvement Plan. This plan shall provide for the installation of a pipe to transport water through the DeSabla forebay, from the terminus of Butte canal to the DeSabla powerhouse intake. At a minimum, the plan shall include: (1) a design of the proposed facility and a schedule for permitting and construction of the new facility; (2) measures to minimize negative impacts to water quality within the forebay during construction, such as sedimentation and erosion control measures; and (3) a description of project operations when the Butte canal or pipeline is out of service, and during project construction, describing how cold water will continue to be provided to Lower Butte Creek during these time periods. Lastly, the plan shall contain a provision for a tap to be installed off of the pipe to provide flows to Upper Centerville canal.

This plan shall also include a provision for monitoring water temperatures for a period of five years after construction of the physical modification is complete and in operation. Water temperature monitoring shall occur in DeSabla forebay and lower

Butte Creek at the following locations: Butte Creek upstream of DeSabla powerhouse, Butte Creek at Lower Centerville diversion dam, Butte Creek at Pool 4, Butte Creek upstream of Centerville powerhouse, and Butte Creek downstream of Centerville powerhouse. However, specific water temperature monitoring locations in DeSabla forebay and Butte Creek should be selected in consultation with the Forest Service, FWS, Cal Fish & Game, and NMFS. On an annual basis, the licensee shall report the results of temperature monitoring to Cal Fish & Game, the Forest Service, FWS, NMFS, the Water Board, the Conservation Groups, and the Commission.

The licensee shall develop the plan after consultation with the Forest Service, FWS, Cal Fish & Game, the Water Board, the Conservation Groups, and NMFS. The licensee shall include with the plan documentation of agency consultation, copies of comments and recommendations made in connection with the plan, and a description of how the plan accommodates the comments and recommendations of the agencies. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that it has been approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Roving Operators*. Upon license issuance, the licensee shall provide a roving operator to inspect and monitor the feeder creek diversion facilities on Helltown Ravine, Inskip, Clear, and Kelsey creeks. The roving operator shall also inspect and monitor the three pipes to be installed in Hendricks/Toadtown Canal (used to provide minimum instream flows to Long Ravine, Cunningham, and Little West Fork creeks), as specified by the Forest Service in modified 4(e) condition 18. At a minimum, this roving operator shall inspect these diversions on a weekly basis, weather dependent, to ensure the required minimum instream flows are being released downstream of each respective diversion.

Draft Article 4xx. *Flow Monitoring and Recording*. Within one year of license issuance, the licensee shall construct, operate and maintain a real-time flow gaging station upstream of the Butte Creek diversion dam and a flow data logger for measuring stream flow downstream of Hendricks diversion dam on the West Branch Feather River, and modify the existing stream gaging station near Lower Centerville diversion dam for real-time access. The licensee shall consult with the United States Geological Survey (USGS) to site, maintain and report information from these gages.

All data recorded by the above mentioned equipment all flows shall comply with United States Geological Survey standards and record flows at a frequency of no greater than 15-minute intervals.

The licensee shall measure and document all instream flow releases in publicly available and readily accessible formats. Flow data collected by the licensee from the stream gages will be made available to the USGS in annual hydrology summary reports. The flow values (generally 15-minute recordings) used to construct the 24-hour average flows will be available to the resource agencies from the licensee upon request.

Draft Article 4xx. *Reservoir Elevation Monitoring and Recording*. Within one year of license issuance, the licensee shall construct, operate and maintain a real-time water temperature and reservoir elevation gage in Philbrook reservoir. The licensee shall consult with the Forest Service, NMFS, FWS, and Cal Fish & Game on the location of these gages within the reservoir. The licensee shall also consult with the United States Geological Survey (USGS) to site, maintain and report information from these gages.

All data recorded by the above mentioned equipment shall comply with USGS standards and record flows at a frequency of no greater than 15-minute intervals.

Draft Article 4xx. *Fish Rescue Plan*. Within 180 days of license issuance, the licensee shall file with the Commission, for approval a plan for rescuing fish from project canals. The plan shall: (1) define activities that would trigger canal fish rescue efforts; (2) provide for the prior notification and coordination with the California Department of Fish and Game; and (3) identify methods to be implemented.

The licensee shall prepare the fish rescue plan, after consultation with the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the Forest Service. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for comments and recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Butte Creek Resident Fish Monitoring Plan*. Following a change to the minimum instream flows on Butte Creek, the licensee shall monitor the response of the fishery in the effected stream reach(s). Monitoring shall occur for two

consecutive years, beginning the fifth year following the alteration of the minimum instream flow. Monitoring methods shall be consistent with those prescribed by the Forest Service in their 4(e) condition 20.

Within 180 days of completing the resident fish monitoring, the licensee shall file a report depicting the status of the monitored fishery, its response to the change in the minimum instream flows, and any recommended future alterations to project operations (e.g. minimum instream flows).

The licensee shall prepare the report, after consultation with the California Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the California State Water Resources Control Board, and the Forest Service. The licensee shall include with the final report documentation of consultation, copies of comments and recommendations submitted on a draft report after it has been prepared and provided to the agencies, and specific descriptions of how the comments are accommodated by the final report. The licensee shall allow a minimum of 30 days for comments and recommendations before filing the final report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

Any recommended alterations to project operations or facilities identified in the final report must first be approved by the Commission before they may be implemented.

Draft Article 4xx. *Federally Listed Anadromous Fish Monitoring Plan*. Within one year of license issuance, the licensee shall file with the Commission, for approval a plan for annually monitoring federally listed fish in lower Butte Creek. The plan shall at a minimum: (1) include annual snorkel surveys to monitor adult distribution and abundance, pre-spawn mortality surveys, and carcass surveys; and (2) provide for the consideration of juvenile emergence and outmigration monitoring in extreme dry years.

The licensee shall prepare the plan, after consultation with the National Marine Fisheries Service, the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the Forest Service. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for comments and recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

Draft Article 4xx. *Federally Listed Anadromous Fish Habitat Monitoring Plan*. Within one year of license issuance, the licensee shall file with the Commission, for approval a plan for monitoring federally listed fish habitat in lower Butte Creek. The plan shall include at a minimum provisions for monitoring and mapping the changes in

behavioral responses of adult Chinook and steelhead, and alterations to their habitats (e.g. spawning gravel locations and quantity) as a result of a change in project operation (e.g. minimum instream flows) downstream of the Lower Centerville diversion dam.

The licensee shall prepare the plan, after consultation with the National Marine Fisheries Service, the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the Forest Service. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for comments and recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

Draft Article 4xx. *Benthic Macroinvertebrate Monitoring Plan*. Within 180 days of license issuance, the licensee shall file with the Commission, for approval a plan for monitoring benthic macroinvertebrates in project-affected stream reaches within Butte Creek. The plans shall provide for monitoring during years 1, 2, 3, and 4, but for a maximum of 2 years per water year type (normal and dry), and include a report for each year monitoring is conducted. Follow-up monitoring shall be in conjunction with the Butte Creek resident fish population monitoring required by Article 4xx.

The licensee shall prepare the plan, after consultation with the California Department of Fish and Game, the National Marine Fisheries Service, the California State Water Resources Control Board, the U.S. Fish and Wildlife Service, and the Forest Service. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for comments and recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Long-term Operations Plan*. Within one year of license issuance, the licensee shall file with the Commission, for approval, a long-term operations plan. The plan shall have the primary goal of seeking to provide cold water for holding, spawning, and rearing Chinook salmon and steelhead in Butte Creek upstream and downstream of the Centerville powerhouse. The plan shall include a protocol for how all project facilities will operate in both, the Butte Creek and the West

Branch Feather River watersheds, how and when water is to be diverted and its delivery location (e.g. Centerville powerhouse tailrace or the Lower Centerville diversion dam), and a preferred schedule for maintenance of project facilities. The plan shall also consider the feasibility of increasing spawning habitat availability by increasing flows in-between the Lower Centerville diversion dam and the Centerville powerhouse during the spawning and egg incubation period (i.e., late-September to February), while balancing power production, and/or augmenting spawning gravels within that reach.

The plan shall provide for an oversight group, the Operations Group, to be made up of representatives from the licensee, National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the California Department of Fish and Game, The California State Water Resources Control Board, and the Forest Service.

The licensee shall prepare the plan, after consultation with the Operations Group. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the Operations Group, and specific descriptions of how the comments are accommodated by the plan. The licensee shall allow a minimum of 60 days for comments and recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Annual Project Consultation*. Consistent with Forest Service 4(e) condition 1, the licensee shall also annually consult with: the California Department of Fish and Game; the California State Water Resources Control Board; the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey.

Draft Article 4xx. *Philbrook Spillway Channel Stabilization*. In addition to the conditions included in Forest Service 4(e) condition 22 (Implement the Philbrook Spillway Channel Stabilization Plan), the licensee shall file the Philbrook Spillway Channel Stabilization Plan for Commission approval and include in the plan, a schedule for filing status reports with the Commission on the ongoing monitoring associated with erosion below the Philbrook spillway channel.

Draft Article 4xx. *Erosion Control Measures.* In addition to the conditions included in BLM 4(e) condition 21 (Control of Erosion), after consultation with the BLM and within one year of license issuance, PG&E should file a schedule with the Commission for completing the reconstruction and maintenance measures along areas of Butte Creek canal and Ditch Creek Road.

In addition to the conditions included in Forest Service 4(e) condition 36 (Transportation System Management Plan), the licensee shall, within one year of license issuance, perform the following road improvements:

- Increased drainage controls (e.g., additional culverts or rolling dips on several roads to reduce production of fine sediments;
- Replace a number of damaged and/or temporary culverts;
- Install velocity dissipators at culvert outlets; and
- Improve management of side cast materials during annual road blading activities.

The licensee shall file a final report describing the results of these road improvement efforts with the California Department of Fish and Game, the National Marine Fisheries Service, the California State Water Resources Control Board, the U.S. Fish and Wildlife Service, the Forest Service, and the Commission within 30 days of completion of these measures.

In addition to the conditions included in Forest Service 4(e) condition 22 (Develop Designs and Implement Actions to Stabilize the Round Valley Spillway Channel), the licensee shall, within one year of license issuance, armor the Round Valley reservoir plunge pool with rip rap and place warning signs to keep visitors away from the steep plunge pool slopes as a means to reduce sediment input to the spillway.

The licensee shall file a final report describing the results of armoring the Round Valley reservoir plunge pool with the California Department of Fish and Game, the National Marine Fisheries Service, the California State Water Resources Control Board, the U.S. Fish and Wildlife Service, the Forest Service, and the Commission within 30 days of completion of these measures.

In keeping with established Best Management Practices, the licensee shall annually perform regular aerial and ground patrols, perform periodic canal repairs and removal of hazard trees, as necessary, and abandon the use of passively automatic siphonic spill equipment.

Draft Article 4xx. *Special Status Species Review and Protection*. The special status species review and protection measures required by Forest Service condition nos. 26 and 27 shall apply to all accessible project lands and shall also include Bureau of Land Management sensitive/watch list species and federal and state rare, candidate, threatened, and endangered species. The Commission reserves the right to require measures to protect special status species.

Draft Article 4xx. *Deer Protection Measures*. The deer protection measures outlined in Forest Service 4(e) condition nos. 28 and 29 shall apply to all project canals.

The licensee shall file a summary wildlife mortality report every 5 years by December 31 outlining any trends in wildlife mortality at project canals. In the event of an increasing trend in wildlife mortalities, the licensee shall include in the report, for Commission approval, additional measures to minimize wildlife mortality, prepared after consultation with the Forest Service and California Department of Fish and Game. The Commission reserves the right to require changes to the deer protection measures.

Draft Article 4xx. *Vegetation and Invasive Weed Management Plans*. The Vegetation Management Plan and Invasive Weed Plan required by Forest Service 4(e) condition no. 31 shall also cover all project lands located outside National Forest System lands to the extent that access is allowed. The Commission reserves the right to require changes to the plans.

Draft Article 4xx. *Foothill Yellow-legged Frog Monitoring Plan*. The licensee, within 1 year from the date of issuance of this license, shall file with the Commission, for approval, a plan to monitor foothill yellow-legged frog populations affected by the project located outside of National Forest Service lands. The plan shall include a detailed description of visual encounter surveys, consistent with "A standardized approach for habitat assessments and visual encounter surveys for the foothill yellow-legged frog" PG&E, May 2002, to be conducted every year for the first 4 years and then every 5 years thereafter. Collection of information on substrate, channel morphology, channel shape and slope, water velocities, canopy, water temperature, riparian and aquatic vegetation, and location of oviposition sites shall be included in the surveys.

The monitoring of yellow-legged frog populations on Forest Service lands required by Forest Service condition no. 20.2 shall include collection of information on substrate, channel morphology, channel shape and slope, water velocities, canopy, riparian and aquatic vegetation, and location of oviposition sites.

The licensee shall prepare the plan after consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments and recommendations are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

If the results of the monitoring confirm that foothill yellow-legged frogs are being adversely affected by the project, the licensee shall file as part of the monitoring report, for Commission approval, measures to protect the frog or proposals for additional studies. The Commission reserves the right to require changes to the yellow-legged frog protective measures or require additional measures or studies.

Draft Article 4xx. *Bald Eagle Monitoring Plan*. The licensee, within 6 months from the date of issuance of this license, shall file with the Commission, for approval, a plan to monitor bald eagle nesting at the project. The plan shall provide for one breeding and one wintering survey every 3 years along with documentation of any incidental bald eagle observations and schedule for providing monitoring reports to the Commission. The monitoring reports shall include recommendations for more frequent monitoring based on increased use of the project area by eagle, changes in project operation and management activities, or information derived from other resource studies.

The licensee shall prepare the plan after consultation with the U.S. Fish and Wildlife Service, Forest Service, and the California Department of Fish and Game. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments and recommendations are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

If the results of the monitoring confirm that eagles nest in the project area, the licensee shall file as part of the monitoring report, for Commission approval, a Bald Eagle Nest Management Plan consistent with the current U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines. The Commission reserves the right to require changes to the bald eagle protective measures or require additional measures.

Draft Article 4xx. *Recreation Resources Management Plan*. Within 5 years of license issuance, the licensee shall file a report documenting the construction and implementation of the proposed recreation measures outlined in the Recreation Facility Rehabilitation and American with Disabilities Act (ADA) Upgrade Plan dated October 2007 as it relates to the relicensing of the DeSabla-Centerville Project. The following

existing facilities shall be operated and maintained for the term of the license: Philbrook reservoir, Philbrook Campground, Philbrook Picnic and Camping Overflow Area, Philbrook Angler Access, DeSabla forebay, DeSabla Group Picnic Area, and Round Valley reservoir.

Draft Article 4xx. *Fish Stocking Plan*. Within one year of license issuance, the licensee shall file with the Commission for approval, a plan to stock fish in reservoirs and affected stream reaches at the project. The plan shall be developed after consultation with Cal Fish & Game and include a description of the amount and location of fish to be stocked in DeSabla forebay, Philbrook reservoir, and other affected stream reaches at the project and an implementation schedule.

The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the entities above, and specific descriptions of how the entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific reasons.

The Commission reserves the right to require changes to the plan. Upon Commission approval the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Recreational Fishery Monitoring*. Within 5 years of license issuance, the licensee shall conduct recreational fishery surveys in addition to the recreation monitoring specified by the Forest Service in 4(e) condition 33. The Licensee shall interview anglers over set daily and weekly time periods beginning immediately after the fifth year of stocking and continuing into mid-September every five years throughout the term of the license. Information gathered shall include: (1) date; (2) time; (3) total time spent fishing; (4) species and sizes of fish retained; (5) species and sizes of fish released; and (6) index of satisfaction. Interviews shall occur in the morning and evening with weekdays and weekend days randomly being selected for each month, including holidays.

The licensee shall include this information in a draft report after consultation with Cal Fish & Game and other entities to be included in the final recreation monitoring report filed every five years. The report shall summarize the results of each survey, providing comparisons between these results and recommendations for stocking the following year. A final report would be filed with the Commission within a year of conducting the surveys.

The agencies shall have 30 days to provide comments and recommendations. The final report shall be submitted to the FERC and shall address recommendations

from the agencies. Final recommendations by the Licensee shall include a description of the proposed stocking regime, responsible entities and additional annual costs, if any, of that proposal.

Draft Article 4xx. *Programmatic Agreement and Historic Properties Management Plan*. The licensee shall implement the "Programmatic Agreement Between the Federal Energy Regulatory Commission and the California Historic Preservation Officer for Managing Historic Properties that May be Affected by Issuance of a License to PG&E for the Continued Operation of the DeSabla-Centerville Hydroelectric Project in Butte County, California (FERC No. 803)," executed on (future date), and including but not limited to the Historic Properties Management Plan (HPMP) for the project. Within 60 days of license issuance, and pursuant to the requirements of the (future date) Programmatic Agreement, the licensee shall implement the filed HPMP with the following modifications: 1) update the HPMP with the additional historic context information provided by BLM, the Forest Service, and the Mechoopda Tribe; 2) develop a collection policy for discovery, curation, and disposition of artifacts, noting that all artifacts from National Forest System lands remain the property of the Forest Service; 3) develop a detailed HPMP section addressing identification, restoration, accessibility, and stewardship collaborations for traditional plant gathering/tending in wetlands and riparian habitat communities culturally important to participating tribes; 4) identify specific management measures to be undertaken and include them within PG&E's best practices or procedural manuals; and 5) include mitigation measures for the Round Valley reservoir site CA BUT 1225/H, the Philbrook Lake Tenders Cabin, and other sites as determined necessary during consultation with applicable agencies and participating Tribes.

In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license. If the Programmatic Agreement is terminated, the licensee shall obtain approvals from or make modifications of the Commission and the California State Historic Preservation Office where the HPMP calls upon the licensee to do so.

Draft Article 4xx. *Use and Occupancy*. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies, for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it

has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction; (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site; and (3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights of way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day

from a project reservoir. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights of way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved Exhibit R or approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Energy Projects, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved Exhibit R or approved report on recreational resources of an Exhibit E; or, if the project does not have an approved Exhibit R or approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

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# APPENDIX B

# DeSabla-Centerville Project Mitigation and Monitoring Summary

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Table B-1. DeSabla-Centerville Project Mitigation and Monitoring Summary with PG&E as the responsible party for all identified mitigation and monitoring.

| | | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| **Impact** | **Mitigation** | **One-time or Ongoing** | **One-time or Ongoing** |
| Geology-Erosion at road-related drainage areas within the project boundary. | Increased drainage controls (e.g., additional culverts or rolling dips) on several roads to reduce production of fine sediments, replace a number of damaged and/or temporary culverts, install velocity dissipators at culvert outlets; and improved management of side case materials during annual road blading activities. | **One-time:** Within 1 year of license issuance, implement these measures as required by draft license article entitled "Erosion Control Measures." | |
| Geology-Erosion at project roads on National Forest System lands. | Develop a project transportation system management plan that includes (1) measures to rehabilitate existing erosion damage and minimize further erosion of project access roads on National Forest System lands; and (2) installation of gates or other vehicle control measures to achieve erosion protection. | **One-time:** File the project transportation system management plan.<br>**Ongoing:** Implement the approved project transportation system management plan throughout project operation. | **Ongoing:** Implement throughout project operation, as appropriate. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Geology- Erosion from the Round Valley dam spillway channel and sediment transport to the West Branch Feather River. | Develop a Round Valley dam spillway stabilization plan that includes (1) an assessment of areas to be stabilized; (2) feasibility-level design drawings for stabilization measures; and (3) a schedule for implementations of the measures. | **One-time:** File the Round Valley dam spillway stabilization plan.<br>Within one year of license issuance, armor the Round Valley reservoir plunge pool with rip rap and place warning signs to keep visitors away form the steep plunge pool slopes as a means to reduce sediment input to spillway.<br>**Ongoing:** Implement the approved Round Valley dam spillway stabilization plan throughout project operation. | **Ongoing:** Implement throughout project operation, as appropriate. |
| Geology- Risk of catastrophic failure due to hazard trees or geologic instability at project water conveyances. | Develop a project canal maintenance and inspection plan that includes (1) annual inspections of the project water conveyance system to identify potential short-term and long-term hazards and to prioritize maintenance and/or mitigation; (2) protocols for routine (non-emergency) canal operations and the use of canal spillways; and (3) stabilization measures to reduce the likelihood of catastrophic canal failure due to hazard trees and geologic hazards and to mitigate sources of chronic erosion and sediment transport into canals. | **One-time:** File the project canal maintenance and inspection plan.<br>**Ongoing:** Continue best management practices such as regular aerial and ground patrols, periodic canal repairs and removal of hazard trees, and the abandonment of passively automatic siphonic spill equipment to reduce the adverse effects of canal failures. | **Ongoing:** Implement throughout project operation, as appropriate. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Geology- Damage caused by any spills, blowouts, canal erosion, or seepage into Butte Creek canal, slope, and road and Ditch Creek Road. | Fix and maintain all areas of the Butte Creek canal on or adjacent to BLM land that show signs of erosion deemed significant by BLM, and which BLM believes would lead to canal failure/blowouts and spills.<br>Reconstruct and maintain areas of Ditch Creek Road that are affected by project-caused erosion. This includes damage caused by any spills, blowouts, canal erosion, or seepage onto Ditch Creek Road. | **One-time:** After consultation with BLM, file a schedule for completing the measures with the Commission.<br>**One-time:** After consultation with BLM, complete the mitigation measures at Butte Creek canal, slope, and road and Ditch Creek Road. | |
| Geology- Erosion below the Philbrook spillway channel. | Develop and implement a Philbrook spillway channel stabilization plan. | **One-time:** File the Philbrook spillway channel stabilization plan that includes a plan for completing stabilization measures.<br>**Ongoing:** Implement the Philbrook spillway channel stabilization plan throughout project operation. | **Ongoing:** Implement throughout project operation, as appropriate. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Entrainment of fish into Butte and Lower Centerville canals and effects on resident fish populations | Develop and implement a Canal Fish Rescue Plan that: (1) defines activities that would trigger canal fish rescue efforts; (2) provides for prior notification and coordination with the Cal Fish & Game; and (3) identifies methods implemented. | **Ongoing:** Ongoing | **Ongoing:** Monitor resident fish populations in Butte Creek to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |
| Entrainment of fish into Hendricks canal and effects on resident fish populations | Install fish screen at intake to Hendricks canal | **One-time:** Develop the plan and implement upon Commission approval.<br>**Ongoing:** Maintenance and cleaning of fish screen | **Ongoing:** Monitor resident fish populations in the West Branch Feather River to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Blocked fish passage at Hendricks diversion dam and limited migration corridor through the West Branch Feather River to Big Kimshew Creek | Fish passage plan for the Installation of a fish ladder and providing a passage corridor within the West Branch Feather River. | **One-time:** Develop the plan and implement upon Commission approval. | **Ongoing:** Monitor resident fish populations in the West Branch Feather River to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |
| Aquatics- Altered seasonal hydrology. | Determine water year type annually and apply to appropriate minimum flow release schedule and other measures that are dependent on water year type (FS modified 4(e) condition 18.2). | **Ongoing:** Annual determination of water year type and application of appropriate minimum flow release schedule | |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Aquatics- Potential effects of modified operations during drought conditions. | Notify the Forest Service and other interested governmental agencies of PG&E's drought concerns; consult with the agencies to develop operational plans to manage drought conditions (FS modified 4(e) condition 18.4). | **Ongoing:** Notification by March 15 of the second or subsequent dry water year; by May 15 of these same years, PG&E would consult with these agencies. As soon as drought conditions are evident, notify and consult with the agencies on potential proposals for modified project operations.<br>If unanimous agreement is not reached, PG&E would submit the revised proposed plan that incorporates as many agency issues as possible to FERC, as well as both assenting and dissenting comments, should they exist, request expedited approval, and implement the proposed plan until directed otherwise by FERC. | |
| Aquatics-Potential short-term increases in turbidity and instream disturbance associated within the removal of the feeder creek diversion dams. | Develop and implement a feeder creek feeder diversion removal plan for Stevens, Little Butte, Oro Fino Ravine, Emma Ravine, and Coal Claim feeder diversions preventing the diversion of water at these facilities and removing barriers to fish movements. | **One-time:** Developing and implementing the plan would be a one-time event. | **Ongoing:** Any monitoring associated with the removal of the diversion dams would be determined during the development of the plan. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Aquatics-Confirmation of compliance with minimum instream flows. | In consultation with USGS: (1) operate and maintain the streamflow gage downstream of Round Valley reservoir and Hendricks diversion dam on the West Branch Feather River (FS modified 4(e) condition 18.4); (2) construct, operate, and maintain a real-time flow gaging station upstream of Butte Creek diversion dam; (3) modify the existing stream gaging station near Lower Centerville diversion dam for real-time data access; and (4) construct, operate, and maintain a stream flow gage with real-time capability downstream of the confluence of both the low level release and spill channel within Philbrook Creek (FS modified 4(e) condition 18.4). | **One-time:** Construct the stream flow gages upstream of Butte Creek diversion dam and in Philbrook Creek, and modify the gage near Lower Centerville diversion dam. | **Ongoing:** Maintain and operate the gages for the term of any license issued. |
| Aquatics- Reduced aquatic biota populations as a result of project stream flow diversions. | Install three pipes with a minimum inside diameter of 4 inches within the Hendricks/Toadtown canal to provide flows to Long Ravine, Cunningham Ravine, and Little West Fork creeks (FS modified 4(e) condition 18.1). | **One-time:** Install the pipes within Hendricks/Toadtown canal.<br>**Ongoing:** Implement the minimum instream flows that would be provided through the operation of these pipes for the term of any license issued. | |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Aquatics- Reduced aquatic biota populations as a result of project stream flow diversions. | Provide a roving operator to monitor and maintain feeder diversion dams. | **Ongoing:** Provide a roving operator for the term of any license issued to ensure required minimum instream flows are being released. | |
| Aquatics-Altered reservoir levels and potential changes to water temperatures within Philbrook reservoir as a result of implementing minimum instream flow releases from Philbrook dam. | Construct, operate, and maintain, in consultation with the USGS, a water temperature and reservoir level gage in Philbrook reservoir with real-time capability. | **One-time:** Construct the reservoir level and temperature gage. | **Ongoing:** Operate and maintain the gages for the duration of any license issued. |
| Aquatics-Construction, operation, and maintenance of existing and proposed project facilities has the potential to contaminate waterways from the introduction of hazardous materials. | Develop and implement a hazardous substances plan (FS modified 4(e) condition 34). | **One-time:** Develop and file the plan<br>**Ongoing:** Implement the approved hazardous substances plan throughout the term of a new license. | |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Aquatics-Reduced aquatic biota populations as a result of project stream flow diversions. | Implement minimum instream flows in each reach as described in FS modified 4(e) condition 18.1 (Philbrook Creek, and downstream of Hendricks diversion dam and Round Valley reservoir) and section 5.2, *Comprehensive Development and Recommended Alternative* (downstream of Butte Creek diversion dam, Lower Centerville diversion dam, and Inskip, Kelsey, Clear, and Helltown Ravine creeks). | **One-time:** Implement minimum instream flows in each project-affect reach for the term of any license issued. | **Ongoing:** Monitor resident fish populations and benthic macroinvertebrates in Butte Creek and the West Branch Feather River to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |
| Aquatics-Potential effects on aquatic resources from changes in controllable instream flow releases. | Ramping rates shall be based on changes in water velocity and stage in foothill yellow-legged frog breeding areas downstream of Butte Creek and Lower Centerville diversion dams. | **Ongoing:** Implement ramping rates as described in section 5.2, *Comprehensive Development and Recommended Alternative*, for the duration of any license issued. | |
| Aquatics-Potential effects on aquatic resources from changes in controllable instream flow releases. | Develop and implement a Ramping Rate Plan. | **One-time:** Develop and file the plan.<br>**Ongoing:** Implement the Ramping Rate Plan throughout the term of any license issued. | **Ongoing:** Monitor resident fish populations and benthic macroinvertebrates to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Aquatics-Potential effects on water temperatures within lower Butte Creek as a result of modified instream flow releases. | Develop and implement a DeSabla Forebay Water Temperature Improvement Plan to include the installation of a pipe to convey water through the forebay, and include a provision to monitor water temperatures in Butte Creek for a period of 5 years after the device is operating and submit annual report on these results to the resource agencies and the Commission. | **One-time:** Develop and file the plan, and construct the facility.<br>**Ongoing:** Implement the approved DeSabla Forebay Water Temperature Improvement Plan throughout the term of a new license. | **Ongoing:** Monitor water temperatures for a period of 5 years after the device is operating.<br>**Ongoing:** Monitor resident fish populations and benthic macroinvertebrates to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license.<br>**Ongoing:** Annually monitor anadromous fish and their habitats in lower Butte Creek. |
| Aquatics-Potential effects on foothill yellow-legged frogs as a result of modified instream flow releases and ramping rates. | Alter ramping rates in project-affected reaches based on foothill yellow-legged frog population monitoring. | **Ongoing:** Consult with the Forest Service and other governmental agencies on information collected from foothill yellow-legged frog population monitoring to determine if ramping rate criteria is protective of yellow-legged frog populations, or if there is a need to modify required ramping rates. | |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Aquatics-Potential effects on aquatic resources from changes in controllable instream flow releases. | Implement an Instream Flow-Ramping Rate Study (FS modified 4(e) condition 18.5). | **One-time:** Implement the plan and file study results with final project operation ramping rates with FERC. | **Ongoing:** Monitor resident fish populations and benthic macroinvertebrates to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |
| Aquatics-Potential effects of project-related diversions on water temperatures in the West Branch Feather and Butte Creek basins. | Develop and implement a Water Temperature Monitoring Plan, to be incorporated as part of the annual Project Operations and Maintenance Plan (FS modified 4(e) condition 20). | **One-time:** Develop and file the plan.<br>**Ongoing:** Implement the plan for the duration of any license issued. | **Ongoing:** Monitor resident fish populations and benthic macroinvertebrates to evaluate response to changes in project operations such as minimum flows, fish screens and passage facilities. During the 3rd year of the license and every fifth year thereafter, for the term of the license. |
| Terrestrial- Potential effects on wildlife habitat from clearing or trimming vegetation | Implement a vegetation management plan to include revegetation of disturbed areas. | **One-time:** Develop and file a vegetation management plan.<br>**Ongoing:** Implement plan through term of license. | |
| Terrestrial- Spread of noxious weeds and invasive plant species from new construction and rehabilitation activities | Implement an invasive weed management plan to minimize the spread of invasive species resulting from project operation and maintenance. | **One-time:** Develop and file an invasive weed management plan.<br>**Ongoing:** Implement plan through term of license. | **Ongoing**: Monitor known populations of invasive species annually for license term; monitor ground-disturbing activities for 3 years. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Terrestrial- Potential effects to foothill yellow-legged frog habitat from changes in magnitude and timing of flow releases | Monitor existing yellow-legged frog populations and implement changes in project operation in the event of adverse effects, including population modeling and viability analysis for West Branch Feather River. | **One-time:** Develop and file a yellow-legged frog management plan.<br>**Ongoing:** Implement plan through term of license. | **Ongoing:** Butte Creek—population surveys would be conducted in years 1-4 and every 5 years thereafter; West Branch Feather River—surveys would be conducted in years 1-5, last 4 years of license; and 6 surveys spread out during intervening period. |
| Terrestrial- Destruction or disturbance of VELB habitat from project operation and maintenance activities | Protect VELB habitat in accordance with the Valley Elderberry Longhorn Beetle Management Plan; conduct pre-construction surveys; replace any lost elderberry plants; and provide educational training for construction crews. | **Ongoing:** Implement the approved plan throughout project operation. | |
| Recreation- Potential increases in project-related recreation use | Development of the Recreation Facility Rehabilitation and American with Disabilities Act (ADA) Upgrade Plan. | **One-time:** Implement the measures outlined in the Recreation Facility Rehabilitation and ADA Upgrade Plan in consultation with the Forest Service within 5 years and file a report upon completion of each of the measures. | |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Recreation- Potential impacts of dispersed camping and OHV use on at the project | Provide streamflow information on project reaches for recreational boating. Implementation of measures to discourage dispersed camping and OHV use at the project. | **One-time:** Restrict vehicle access beyond road shoulder with boulders; install signs for pack-in/pack-out and appropriate sanitation. | |
| Recreation- Potential changes in recreational use of project area | Develop recreation use monitoring, reporting and use triggers in consultation with both the Forest Service and BLM to periodically monitor changes in recreation use patterns at the project every five years. | **Ongoing:** Conduct the recreation monitoring, to include both creel surveys and an annual boating count, every five years to allow for enhanced assessment of the adequacy of public recreation facilities and access at the project for the life of the project. | |
| Recreation- Potential changes in water-based recreation use of project area | Develop and implement fish stocking plan for project reservoirs and reaches after consultation with Cal Fish & Game. | **One-time:** Stock 7,200 lbs of fish in DeSabla Forebay during the first 5 years of the license.<br>**Ongoing:** Conduct creel surveys every 5 years to determine angler satisfaction and to determine the amount and location of fish to be stocked at the project reservoirs and reaches after consultation with Cal Fish & Game. | **Ongoing:** Conduct creel surveys every 5 years to determine angler satisfaction during the term of the license. |

| Impact | Mitigation | Mitigation Implementation Duration | Monitoring Duration |
|---|---|---|---|
| | | One-time or Ongoing | One-time or Ongoing |
| Recreation/Aesthetics- Potential loss of DeSabla forebay recreational fishery due installation of the temperature reduction device. | Develop and implement a plan to monitor the aesthetic value of the DeSabla forebay for 1 year following the installation of the temperature reduction device. | **One-time:** File a report, after consultation with Cal Fish & Game and the Water Board, to include a description of effects of the temperature reduction device on the aesthetic value and recreational fishery and propose measures to mitigate for any negative impacts associated with pipe installation. | **One-time:** Monitor the effects of the temperature reduction device on the DeSabla forebay for a period of 1 year within license issuance. |
| Land Use- Potential effects of project operations and construction on project roads | Develop a project transportation system management plan for the protection and maintenance of roads associated with the project. | **Ongoing:** Implement the transportation system management plan and determine responsibilities and schedule for coordination and maintenance of project roads: include an inventory of roads necessary for the project; and implement temporary traffic controls during construction. | |
| Land Use- Potential effects of project operations and construction on project roads | Develop a traffic monitoring plan. | **One-time:** Develop and implement a traffic monitoring plan to determine project-associated use on roads within the project area as well as assist in the development of road share costs. | |
| Cultural – Potential impacts on historic properties on project lands from project-related ground-disturbing activities. | Follow protocols set forth in the Historic Properties Management Plan (HPMP). | **Ongoing:** Implement the HPMP, as appropriate. | |

# APPENDIX C

## Comments on the Draft Environmental Assessment

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# APPENDIX C

## Response to Comments on Draft Environmental Assessment

### General Comments

**Comment 1:** The Conservation Groups[91] state that that they do not recommend dam removal as an alternative to relicensing the project as staff depicted on page 38 of the draft environmental assessment (EA), and that their recommendation seeks to make use of most of them.

**Response:** In the draft EA we did not state that the Conservation Groups' recommendation would result in dam removal as an alternative to relicensing. We stated that the Conservation Groups' recommendation would result in the phased removal of the Lower Centerville powerhouse, canal, and diversion dam. However, we note that the Conservation Groups' 10(a) recommendation 1(d) states "…unless resource agencies unanimously agree on reverting to prior project configuration, licensee will decommission the Centerville Development, including removal of Lower Centerville Diversion Dam and removal of Lower Centerville Canal." As a result, in the final EA section 2.5.3, we now state that the Conservation Groups' alternative "…may include the phased-in decommissioning of the Centerville powerhouse, Lower Centerville canal, and Lower Centerville diversion dam."

**Comment 2:** The Conservation Groups request the Federal Energy Regulatory Commission (Commission or FERC) re-work the draft EA and reissue it as a draft environmental impact statement (EIS).

**Response:** On the basis of our independent analysis, we find that the issuance of a license for the DeSabla-Centerville Hydroelectric Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment. Therefore, the preparation of an EIS under the National Environmental Policy Act is not warranted.

**Comment 3:** The California State Water Resources Control Board (the Water Board) states the draft EA incorrectly identifies the State Water Board as a responsible agency under the California Environmental Quality Act (CEQA).

**Response**: We have modified the text in the final EA to identify the Water Board as the "lead agency" under CEQA.

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[91] The California Sportfishing Protection Alliance, Friends of Butte Creek, American Whitewater, and Friends of the River collectively comprise the Conservation Groups.

**Comment 4**: The U.S. Fish and Wildlife Service (FWS) comments that the manner in which we addressed the 10(j) recommendations by splitting them out was confusing and that the breakdown of the 10(j) recommendations in the draft EA (table 5-3) was not in the same order they were filed in the resource agencies' ready for environmental analysis letters.

**Response**: We received a total of 54 different 10(j) recommendations from FWS, the California Department of Fish and Game (Cal Fish & Game), and the National Marine Fisheries Service (NMFS). We attempted to address similar recommendations from different agencies together in the draft EA. To reduce redundancy we combined and addressed similar recommendations together and not necessarily in the order presented in the resource agencies' letters. This approach was also used in table 5-3 where recommendations were often combined or separated out; however, recommendations in table 5-3 were grouped by resource area to aid the reader.

**Comment 5**: FWS notes that replacing, rebuilding, or refurbishing the Centerville powerhouse could be a major reconstruction event with significant adverse effects on listed salmonids in Butte Creek and that due to the lack of specificity in the final license application, it was unable to fully analyze the cumulative effect of such a reconstruction event. FWS also notes that such an event would reopen the licensee to formal consultation under section 7 of the Endangered Species Act (ESA) regarding the listed salmonids in Butte Creek.

**Response:** The proposal that is before the Commission for licensing is the project as proposed by Pacific Gas and Electric Company (PG&E) in its 2007 license application. Currently, PG&E is not proposing to replace, rebuild, or refurbish the Centerville powerhouse. If in the future PG&E were to propose to replace, rebuild, or refurbish the Centerville powerhouse, the Commission would then prepare any necessary environmental analyses of PG&E's proposal including, if appropriate, consultation under the ESA.

**Comment 6**: NMFS comments that it erred in failing to include the U.S. Forest Service (Forest Service) as a consulting partner in the development of a long-term operations plan and requests the Commission add this agency.

**Response**: We have modified the text in the final EA to include the Forest Service as a consulted agency in the development of this plan.

**Editorial Comments**

**Comment 7**: The Conservation Groups comment that water temperature modeling runs 8 through 15 in appendix B (table 1) of the draft EA appear twice and that runs 1 through 7 were omitted.

**Response**: We have modified appendix B (table 1) in the final EA in response to the Conservation Groups' comment. Appendix B (table 1) now includes all water temperature modeling runs completed by PG&E, including runs 1 through 7, which were omitted in the draft EA.

**Comment 8**: The Conservation Groups comment that the "pdf" versions of tables in the draft EA are illegible.

Response: In the final EA all "pdf" versions of tables presented in the draft EA have been updated to improve their readability.

**Comment 9**: The Forest Service comments that, on page 141 of the draft EA, there appears to be an incorrect reference to a project reservoir. The draft EA states that, "Therefore, by late July or August, the West Branch Feather River downstream of Philbrook Reservoir dam is an intermittent stream containing only isolated pools." The Forest Service recommends that "Philbrook" be changed to "Round Valley."

**Response**: We have modified the text in the final EA to reference Round Valley dam in response to the Forest Service's comment.

**Comment 10**: Some of the draft EA reviewers noted editorial inconsistencies throughout the document.

**Response**: We appreciate the careful review of the draft EA and have modified the text in the final EA in response to these editorial comments.

**Geology and Soils**

**Comment G-1**: The Forest Service comments that, on page 48 of the draft EA (*Reservoir Shoreline and Streambank Conditions*), the first paragraph states that canal-flume capacities (on the West Branch Feather River side) are about 85 to 110 cubic feet per second (cfs). On page 20 of the draft EA, the text indicates this flume capacity is up to 125 cfs. The Forest Service recommends this flume capacity be consistent throughout the document.

**Response:** We have modified the text under *Reservoir Shoreline and Streambank Conditions* of the final EA to reflect a 125 cfs flume capacity.

**Comment G-2:** The Forest Service comments that the second paragraph on page 48 of the draft EA (*Reservoir Shoreline and Streambank Conditions*) ends with a discussion concerning the lack of shoreline effects from boat wakes on Round Valley reservoir due to the lack of boating access but does not address any other type of shoreline damage. The Forest Service further comments that this leaves the reader with the impression that there is no reservoir shoreline disturbance at Round Valley reservoir, which conflicts

with known cultural site damage at this reservoir from operational flow fluctuations as documented in PG&E's cultural reports for this area. The Forest Service recommends this paragraph be expanded to address this other type of shoreline erosion induced by seasonal fluctuations from project operations. The Forest Service also comments that the last paragraph under *Reservoir Shoreline and Streambank Conditions* ends with a similar discussion of the lack of boat wake erosional impacts at Philbrook reservoir, but again, does not address erosion induced by seasonal operational elevation changes to the shoreline. The Forest Service recommends this be addressed to provide a full picture to the reader of what erosion is occurring on reservoir shorelines.

**Response:** Text has been added to the *Reservoir Shoreline and Streambank Conditions* section of the final EA to expand the discussion of shoreline erosion at Round Valley reservoir and Philbrook reservoir caused by seasonal fluctuations in project operations.

**Comment G-3:** The Forest Service comments that the Commission's cost estimate for stabilization of the Round Valley dam spillway and the Philbrook spillway channel is shown to be identical (i.e., one-time capital cost of $480,000, annualized cost of $96,000). However, it comments that these spillways are very different, which should be reflected in these costs. This estimate is considerably high for Round Valley and considerably low for Philbrook spillway.

The Forest Service further comments that for the Round Valley spillway, its preliminary 4(e) required specific measures to resolve the localized erosion occurring directly below the spillway at the dam. For the Philbrook spillway, there is a well-detailed 50 percent design plan with costs of $2,778,285 (significantly exceeding the Commission's one-time cost estimate of $480,000). The Forest Service recommends that the Commission develop more accurate costs that differ for these two spillways.

Finally, the Forest Service comments that restoration needs in both spillways are the result of past/on-going project operations, not a result of issuance of a future license. Therefore, the Forest Service recommends that these costs not be included as relicensing costs in the EA at all.

**Response:** On March 19, 2009, PG&E filed a table entitled "Summary Table of Preliminary Terms and Conditions, Recommendations and Comments Proposed by DeSabla-Centerville Relicensing Participants." Using PG&E's costs, we have revised the costs associated with stabilization of the Round Valley spillway channel (a capital cost of $620,000 and an annual cost of $30,000) and the Philbrook spillway channel (a capital cost of $9,506,000 and an annual cost of $60,000).

The erosion that is occurring in both the Round Valley and Philbrook spillways is a result of past/on-going operations. Therefore, our recommended mitigation for this project effect, the Round Valley dam spillway stabilization plan and the Philbrook spillway channel stabilization plan, may be components of any new license issued to PG&E. If

included in a new license, this mitigation would result in expenses incurred by PG&E and required by the Commission. Therefore, it is appropriate for us to consider these costs and include them in the environmental document as relicensing costs.

**Comment G-4:** The Water Board comments that the project has a high risk and history of canal failure. The draft EA concludes that continued operation of the project presents ongoing risk of adverse environmental impact. Then it concludes that failure during or immediately following inclement weather is of less consequence to the fishery. The Water Board notes that data are not provided to support this statement. Canal failure has a high potential to cause violations of the water quality objectives. The draft EA states that continuation of best management practices and compliance with a project canal maintenance and inspection plan would provide mitigation for canal failure. The Water Board comments that the details of the measures must be provided in the final EA to demonstrate they would mitigate the impacts.

**Response**: Regarding our statement that failure during or immediately following inclement weather is of less consequence to the fishery, we have deleted this statement from the final EA.

The Water Board inaccurately comments that the Commission concluded in the draft EA that continuation of best management practices and compliance with a project canal maintenance and inspection plan will provide mitigation for canal failure. Page 57 of the draft EA and section 3.3.1.2, *Environmental Effects, Water Conveyance Geologic Hazards Risk*, of the final EA states that best management practices and a project canal maintenance and inspection plan will *reduce* the risk of catastrophic canal failure due to hazard trees or geologic instability, not mitigate for canal failure.

We note that page 56 of the draft EA provides examples and details of PG&E's best management practices. These include reduction of water levels in the water conveyance facilities before and during storm events to increase available freeboard and reduce the risk of overtopping from a minor rockslide or hazard tree entering the canal, performance of regular aerial and ground patrols, performance of periodic canal repairs and removal of hazard trees, and the abandonment of passively automatic siphonic spill equipment. These best management practices are also described in section 3.3.1.2, *Environmental Effects, Project Canal Maintenance and Inspection*, of the final EA.

In addition, page 56 of the draft EA outlines the details of the project canal maintenance and inspection plan proposed by PG&E and recommended by the Forest Service, NMFS, FWS, and Cal Fish & Game. Elements of the plan include:

- Annual inspections of the project water conveyance system to identify potential short-term and long-term hazards (e.g., hazard trees, landslides) and to prioritize maintenance and/or mitigation;

- Protocols for routine (non-emergency) canal operations and the use of canal spillways; and
- Stabilization measures to reduce the likelihood of catastrophic canal failure due to hazard trees and geologic hazards and to mitigate, as appropriate, sources of chronic erosion and sediment transport into canals.

The details of PG&E's project canal maintenance and inspection plan are also described in section 3.3.1.2, *Environmental Effects, Project Canal Maintenance and Inspection*, of the final EA.

We also note that the Forest Service's 4(e) condition 23 requires PG&E to, within 1 year of license issuance and after consultation with the Forest Service, the Water Board, Cal Fish & Game, and other applicable agencies, develop and implement a project canal maintenance, inspection, and hazard prevention plan. The Water Board would have the opportunity to participate in the development of the plan and can ensure that the appropriate details are included to mitigate for and/or prevent canal failure. In the draft and final EA, we recommend that this condition be made part of any new license issued to PG&E.

**Comment G-5:** The Conservation Groups comment that they don't understand the draft EA's finding that their recommendation for PG&E to remediate the upper portion of the spill channel just above Centerville powerhouse is not necessary. On May 28, 2009, the Conservation Groups filed with the Commission a presentation on erosion at the Centerville powerhouse spillway channel. The presentation contained information, including photographs, documenting the alleged erosion problems at the spillway channel.

**Response:** We have reviewed the information regarding the current status of the Centerville powerhouse spillway channel and have forwarded the Conservation Groups' submission to the Commission's Division of Dam Safety and Inspections for review under the current license. In the draft EA we concluded that no further measures, by PG&E, were necessary to stabilize or remediate the spill channel below the Centerville powerhouse. However, depending on the outcome of the Division of Dam Safety and Inspection's review, remediation of the spillway may be necessary.

**Aquatic Resources**

<u>Water Temperature/Temperature Modeling</u>

**Comment A-1:** The Conservation Groups comment that the draft EA used the weekly mean of the maximum temperature (WMMT) metric without acknowledging this use in its narrative, and without explaining a rationale for its use.

**Response:** On page 159 of the draft EA, we indicated that three temperature metrics were evaluated by PG&E during water temperature modeling efforts and that these results were included as appendix B to the draft EA. A description of these three metrics, including WMMT, was also included on page 159 of the draft EA, along with the benefits associated with the use of each metric. In section 3.3.2.2 of the final EA, we provide additional information on these three metrics in response to the Conservation Groups' comment.

**Comment A-2:** The Conservation Groups indicate that, on page 15 of PG&E's July 30, 2008, filing of alternative conditions, PG&E states that a 0.38°C difference in WMMT downstream of Centerville powerhouse is considered "biologically significant." The Conservation Groups request clarification from PG&E and the Commission on why a 0.38°C difference in water temperatures downstream of the Centerville powerhouse is considered biologically significant but five times that differential is not significant above the Centerville powerhouse.

**Response:** In the draft EA, we did not make reference to the term "biologically significant" in reference to changes in stream temperatures in the project area. Additionally, we cannot address PG&E's definition of the term "biologically significant" or speculate as to why it was used in its documents referencing water temperatures downstream of Centerville powerhouse.

**Comment A-3:** The Conservation Groups comment that regardless of what most or all of the parties to the relicensing believe to be the case about the overall benefit of the project to these Evolutionary Significant Units (ESU), the lack of quantification of the thermal benefit of the project to these ESUs should be stated in a revised draft EIS on the relicensing proposal. The Conservation Groups specifically reference pages 256 through 257 of the draft EA where the benefits of the project to spring-run Chinook salmon and steelhead are discussed.

**Response:** The intent of the Conservation Groups' comment is unclear. The project is operated such that colder water stored in Philbrook and Round Valley reservoirs in the West Branch Feather River drainage is diverted to the Butte Creek drainage during the summer months to reduce water temperatures in lower Butte Creek for ESA-listed species. The draft EA explains in detail the results of water quality monitoring throughout the project area (pages 87 through 100) and the results of water temperature modeling conducted by PG&E is discussed throughout section 3.3.2.2 of the draft EA. These data and results clearly indicate water temperatures are reduced in Butte Creek as a result of managing and diverting cooler water from the West Branch Feather River. In turn, by reducing water temperatures that otherwise would naturally occur in Butte Creek, we concluded this creates a net benefit for these ESA-listed species based upon their historic biological response to prolonged periods of hot temperatures in Butte Creek.

**Comment A-4:** The Conservation Groups comment that they cannot determine on which numbers the temperature figures cited on page 376 of the draft EA are based. The Conservation Groups state that the differential in WMMT output below Centerville powerhouse between run 6 (50 percent reduction in thermal loading) and run 7 (80 percent reduction in thermal loading) in a normal year is 0.24°C and the differential in WMMT output below Centerville Powerhouse between run 22 (50 percent reduction in thermal loading) and 23 (80 percent reduction in thermal loading) in a dry year is 0.13°C.

**Response:** On page 376 of the draft EA, the statement referenced by the Conservation Groups reads, "Without taking into account minimum instream flows in the lower West Branch Feather River, during normal and dry water years, reducing thermal loading within DeSabla forebay by 80 percent would further decrease the weekly mean of the daily maximum temperature during the hottest week of the summer by approximately 0.23°C and 0.19°C, respectively, in lower Butte Creek." In the draft EA, we averaged the difference between three WMMT outputs (Butte Creek below Centerville powerhouse, Butte Creek above Centerville powerhouse, and Butte Creek at Helltown) between a 50 and 80 percent reduction in thermal loading. This yielded an average reduction in thermal loading of -0.24°C, based on differences of -0.24°C, -0.23°C, and -0.24°C in normal water years, and -0.19°C, based on differences of -0.13°C, -0.14°C, and -0.29°C, in dry water years. However, in light of new recommendations from the agencies for the installation of a pipe to convey water through DeSabla forebay, this analysis in the draft EA, which was based on a baffle wall system, has been deleted. Therefore, this section has been revised, and references to these temperatures in question by the Conservation Groups have been eliminated in the final EA.

**Comment A-5:** The Conservation Groups state that we did not disclose why we chose to use the WMMT metric in our analysis in the draft EA. The Conservation Groups comment that they used the mean daily average metric because agency biologists felt that the water temperature differences in the long-term were probably more significant than a worst case comparison.

**Response:** There are distinct advantages to using each of the three metrics (the mean temperature difference, largest change in daily maximum temperature, and the WMMT) presented in PG&E's temperature modeling output. We elaborate in section 3.3.2.2 of the final EA on the benefits of each of these metrics and discuss why the WMMT was chosen for analysis purposes. We used the WMMT metric for the insight it gives into the hottest week of the summer, a timeframe with potential significant implications on the health and survival of spring-run Chinook salmon in lower Butte Creek. However, we do not oppose or disagree with using either of the other two metrics for analysis purposes. For this reason, we provided the output for all three metrics as appendix B, tables 1 and 2, of the EA for readers to reference and compare with the output from the WMMT metric.

**Comment A-6:** The Water Board comments that Cal Fish & Game previously submitted comments on the W2 temperature model which suggested the output of the model should

only be used to compare the alternatives and that the draft EA incorrectly implies the model output is real.

**Response:** We clarify in the final EA that the temperature modeling output should be viewed as a tool to assist in comparing the effects of implementing various instream flow alternatives in project-affected reaches.

Turbidity Sensors

**Comment A-7:** The Conservation Groups comment that we misunderstand the purpose of their recommended turbidity sensors. The Conservation Groups state that the intent of these sensors is to allow for quick detection and correction of turbidity related problems. The Conservation Groups further state they do not agree with the recommendation in the draft EA to not support the installation of these monitors and that considering the value of the resource, the annual cost is justified.

**Response:** We appreciate the additional information provided by the Conservation Groups regarding the purpose of the recommended turbidity sensors and have provided additional text in the final EA to reflect the purpose of these sensors.

DeSabla Forebay Temperature Reduction Device

**Comment A-8:** The Water Board states it does not believe that the development of a temperature reduction device can be deferred until after license issuance. The Water Board states that the DeSabla forebay water temperature improvement plan should be developed prior to water quality certification for the project and that a preliminary design is necessary to evaluate the potential impacts of the construction and operation of the temperature reduction device in the CEQA process, and to determine compliance with water quality standards.

**Response:** In section 3.3.2.2 of the final EA, we analyze the effects of operating the proposed temperature reduction device on instream water temperatures in lower Butte Creek. Additionally, as discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, we recommend that the Water Board be a consulted party during the development of this plan. This plan would address measures to minimize negative effects during construction of the pipe such as erosion and instream turbidity, as well as a description of project operations during construction that would detail how cold water would continue to be delivered to lower Butte Creek for the benefit of ESA-listed species. Therefore, we conclude our recommended measures would be adequate for the Water Board to determine compliance with water quality standards.

**Comment A-9:** The Conservation Groups state that reducing thermal loading by 80 percent and shutting down the Centerville powerhouse would result in conditions where, "FISH DON'T DIE." Also, NMFS comments that it is unclear how we determined a 50

percent reduction target is acceptable while providing little temperature control device information. FWS comments that it now recommends that its 10(j) recommendation 5 be modified to reflect the installation of a pipe that would take water directly from the canal to the intake to reduce thermal heating in the DeSabla forebay. FWS states this option would minimize thermal loading over other options, may be easier to install, and may eliminate uncertainty associated with specific reductions of water temperature percentages. FWS also states that with eliminating references to percentage of thermal loading, PG&E would have fewer compliance issues. Cal Fish & Game also comments it supports the installation of a pipe to reduce thermal loading.

**Response:** As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, of the final EA, based upon additional information provided at the April 13, 2009, section 10(j) meeting and in comments received from the agencies on the draft EA, we now support the agencies revised recommendations for PG&E to install and operate a pipe to convey water through the DeSabla forebay. As discussed in section 3.3.2.2 of the final EA, this pipe would be the most efficient alternative in terms of reducing thermal loading within the forebay. As discussed in section 5.2, *Comprehensive Development and Recommended Alternative* of the final EA, we conclude that the environmental benefits of shutting down the Centerville powerhouse would not justify the costs associated with this lost generation. Additionally, we do not agree that it can be stated with absolute certainty that the modifications to project operations as recommended by the Conservation Groups would prevent a fish kill if an extreme, prolonged temperature event were to occur. As discussed in section 3, shutting down the Lower Centerville development would result in water temperatures that are less beneficial to the ESA-listed anadromous fish in lower Butte Creek than our recommended alternative.

**Comment A-10:** FWS comments that the cost estimates for both the staff alternative (50 percent reduction in thermal loading) and FWS' 10(j) recommendation 5 (80 percent or greater thermal loading) were higher than a draft cost estimate provided in a draft document submitted to the Commission as license application appendix E611.2.2.3 (Ryan, 2007). FWS also notes that Ryan (2007) was not a Commission-accepted study plan, reviewed by stakeholders, or peer reviewed. NMFS and the Conservation Groups request clarification on how cost estimates for the DeSabla forebay temperature reduction facility were determined in the draft EA.

**Response:** During the development of the draft EA, we attempted to use the best information available to formulate our analysis, conclusions, and cost estimates. Although Ryan (2007) was not a Commission-accepted study plan, upon review, we deemed the study to contain reasonable cost estimates for various potential thermal reduction facilities for the DeSabla forebay and it was used in combination with cost estimates provided in PG&E's license application to generate cost estimates. Cost estimates for a temperature reduction facility that reduces thermal loading by 50 percent were provided by PG&E in the license application, which was estimated at $2 million

dollars for the construction and operation of a partial baffle facility. Costs were estimated for the agency recommended facility (80 percent reduction) by using the *Study on the Reduction of Heating in the DeSabla Forebay* (Ryan, 2007), which included estimated costs for a variety of temperature reduction facilities. Ryan (2007) estimated that the cost of a facility that reduces thermal loading by 80 percent would cost approximately $ 750,000 to $1 million more than a facility that reduces thermal loading by 50 percent, for an estimated cost of approximately $ 3 million. However, we note that the agencies now recommend installation of a pipe to reduce temperatures within the forebay and, as a result, we have updated our cost estimates in the final EA.

**Comment A-11:** FWS comments that it appears the recommendation for reducing thermal loading within the DeSabla forebay is based on perceived cost of the facility. FWS requests clarification on how FWS 10(j) recommendation 5 received equal consideration under section 4(e) of the Federal Power Act (FPA) and to explain how the condition is inconsistent with the comprehensive planning standard of section 10(a). FWS does not believe cost alone is a reason for denying this recommendation.

**Response:** As discussed on pages 375 through 376 of the draft EA, we concluded the limited additional temperature benefits associated with the agencies recommendations for an 80 percent thermal loading reduction facility did not justify the additional costs. However, as noted in our response to comment A-9, above, we now support the installation and operation of a pipe to reduce thermal loading in the forebay, which is the most efficient alternative to reducing temperatures within the forebay, and thus eliminates the need to have specific temperature reduction goals.

Fish Population Analysis

**Comment A-12:** Cal Fish & Game and NMFS disagree with our analysis in the draft EA in which we found the fish populations in project-affected stream reaches to be viable and generally healthy, stating that with the analysis is not consistent with the census data that show the mean linear abundance of trout has exhibited a downward trend over the term of the current license.

Cal Fish & Game recognizes that our analysis was generally based on three concepts: (1) age class structure; (2) condition factor; and (3) species composition and refutes our analysis on each of these. First, Cal Fish & Game takes issue with our use of length frequency data collected from fish within the project's canal system not project-affected stream reaches, and states that length frequency data from the project-affected stream reaches is insufficient to support our conclusion. Second, Cal Fish & Game takes issue with our use of condition factors of fish sampled from the project's canal system, stating that fish entrained into the project canal system do not have ready-access to project-affected stream reaches as implied by our analysis. Finally, Cal Fish & Game states that we used only current and historical species composition and ignored species abundance

when determining the viability of fish populations within the project-affected stream reaches.

**Response:** We have provided additional information and analysis in section 3 of the final EA to support our conclusion that trout in project-affected stream reaches are viable and generally healthy. These data include condition factors of trout sampled from project-affected stream reaches, as well as trout population data from 2007, which demonstrate an increase in the population from the 2006 data.

Fish Screens at Lower Centerville Diversion and Fish Screens and Ladder at Hendricks Head Dam

**Comment A-13:** As discussed above, because Cal Fish & Game does not agree with our conclusion in the draft EA that fish populations in project-affected stream reaches are viable and generally healthy, it reasserts the need for a fish screen at the Lower Centerville diversion and a fish screen and ladder at the Hendricks diversion dam. NMFS and FWS also find that fish screens at the Lower Centerville diversion are needed to prevent entrainment of native rainbow trout (*Oncorhynchus mykiss)*, that may exhibit a marine life history (steelhead) and are potentially important to the recovery of the Central Valley steelhead distinct population segment. Further, FWS states that our not adopting the recommendation for fish screens and/or ladders was based on cost and it requests clarification of how its 10(j) recommendation received equal consideration under section 4(e) of the FPA and how its recommendation is inconsistent with the comprehensive planning standards of section 10(a) of the FPA.

**Response:** Relicensing studies found that fish are entrained in to project canals as a result of project operations. As a result, to enhance resident fish populations within Butte Creek and the West Branch Feather River, in the draft EA, we recommended increasing minimum instream flow within project bypassed reaches to increase available habitat and provide fish rescues within project canals to rescue entrained fish, including resident rainbow trout that may exhibit an anadromous life history. We did not recommend providing fish screens and the Lower Centerville or Hendricks diversion dams or a fish ladder at the Hendricks diversion dam. However, as a result of the section 10(j) process, discussed below in section 5.4 of the final EA, we no longer recommend increasing minimum instream flows at the Hendricks diversion dam. Alternatively, we now recommend that PG&E develop and implement a fish screen and passage plan for the Hendricks diversion dam and for the enhancement of resident fish populations within the West Branch Feather River. The details of which are discussed below in section 5.4.

While we do not recommend the installation of a fish screen at the Lower Centerville diversion, we do recommend, as discussed above and in section 5.4 of the final EA that PG&E increase the minimum instream flows provided from the Butte Head and Lower Centerville diversion dams. Additionally, we recommend that PG&E conduct annual fish rescues from the Lower Centerville and Butte Creek canals, to rescue fish, including

resident rainbow trout that may exhibit an anadromous life history that have been entrained into project canals.

The increase in stream flows would provide additional habitat to the resident fish populations within Butte Creek, downstream of the Butte Head dam and would also support the anadromous ESA-listed populations and improve the designated critical habitat as discussed in section 3.3.2 of the final EA, *Aquatic Resources*. Additionally, canal fish rescues will allow for the relocation of fish that have been entrained in the canal system back to the natural stream habitats.

Regarding FWS' concern that our not adopting of the recommendation for fish screens and/or ladders was based on cost, see our response to comment A-19.

Resident Fish Monitoring

**Comment A-14:** Regarding the frequency in which fish populations in the West Branch Feather River and Butte Creek are monitored, Cal Fish & Game states that it did not make a recommendation for annual monitoring of resident fish as stated in our January 14, 2009 10(j) letter to them. Cal Fish & Game states that it supports our recommendation to monitor resident fish populations for two consecutive years, beginning in the fifth full year after implementation of any minimum instream flows required by a new license. However, NMFS and FWS disagree with our recommendation that the monitoring be discontinued following the next monitoring cycle (5 years after the last change in minimum instream flows). Cal Fish & Game states that long-term monitoring would be useful in assessing trends in resident fish population, not only in response to changes in project operations but also natural and climate changes, allowing for realistic adaptive management of minimum instream flow releases.

**Response:** FWS during the April 14, 2009, section 10(j) meeting echoed Cal Fish & Game and provided staff with a peer reviewed paper *Detecting biological responses to flow management: Missed opportunities; Future directions* (Souchon et al., 2008). Souchon states that common trends in monitoring have been focused on compliance monitoring, not the response of a target species to a change in project operations, (e.g., change in minimum instream flows). We agree with Souchon in that the duration of monitoring should be adequate to capture the target species' response to the stimulus, not just for monitoring compliance with the project's license conditions. While monitoring fish populations within 5 years of a change in project operations, as recommended by FWS and NMFS, would allow for a review of how the fishery responds to the change in project operation, we find that this information is not needed to determine the actual effectiveness of a change in project operation. Rather it is more appropriate to measure the fishery's response after it has had time to occur. Therefore, as supported by Cal Fish & Game, in the draft EA we recommended that monitoring be initiated 5 years following any change in operations. Waiting 5 years will allow the target resource (resident fish) to respond to the changes in project operations.

Additionally, Souchon describes long-term monitoring to be for periods greater than 2-3 years. The 10(j) agencies, by default, characterize our recommended monitoring regime as short-term, as they desire "long-term" monitoring for the duration of the license, to allow for an assessment of trends in the fish population's, responses to natural and climate changes, allowing for realistic adaptive management of minimum instream flow releases. However, we contend that our recommended monitoring regime in the draft EA is not short-term. Resident fish population monitoring to support the relicensing of the project in began in 2006 and continued in 2007, providing baseline (current condition and operations) information on fish population. Waiting 3 to 5 years after implementing a change to current project operations would allow for the fishery to respond to the change and allow for documentation of that response; providing a monitoring period of nearly a decade, not 2 to 3 years.

Additionally, while we find that monitoring fish populations for the duration of the license to responses to natural and climate changes outside of the licensee's control, is not appropriate and should be the responsibility of the fishery management agencies, tracking trends in populations would help inform an adaptive management program should one be required by the Commission. Therefore, because we are recommending that PG&E implement an adaptive management program as discussed in section 5.2 of the final EA, we are recommending that resident fish populations within Butte Creek and the West Branch Feather River be monitored every 5 years for the duration of the license, to inform the decision-making process to be implemented through the adaptive management program. See sections 5.2 and 5.4 of the final EA for more details.

**Comment A-15:** NMFS comments that resident fish monitoring should be conducted in response to changes in project operations that may affect water temperatures, not just changes in minimum instream flows.

**Response:** We agree with NMFS and have modified the text in the final EA to indicate that monitoring should be conducted following a change in project operations or facilities that may influence a response in a target resource.

**Comment A-16:** FWS states that our reason for "denial" of the non-listed resident fish monitoring portion of its section 10(j) recommendation 6 was based on cost and "because the non-listed resident fish did not seem as imperiled (in Staff's view) as the listed salmonids" and requests that we clarify how this section 10(j) recommendation received equal consideration under sections 4(e) and 10(a) of the FPA.

**Response:** When evaluating 10(j) recommendations for fish and wildlife resources to be protected we must also ensure that the 10(j) recommendations are consistent with other applicable laws including the FPA. Section 4(e) of the FPA states that "the Commission, **in addition to the power and development** purposes for which licenses are issued, shall give **equal consideration** to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife…" Section 10(a) of the

FPA states "…**in the judgment of the Commission** will be **best adapted** to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of **water-power development**, for the **adequate** protection, mitigation, and enhancement of fish and wildlife…and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)."

To comply with the FPA and its relevant sections, when evaluating 10(j) or other recommendations we ask the following questions:

- Does the resource provide significant use, generating significant revenue for the local area?
- Are there significant regional or national programs to recover a species?
- Do the resources have particular legal standing, such as an endangered species or wild and scenic rivers?
- Is the resource of regional or national significance?
- Can the generation be easily replaced or would it require additional diesel generation?
- Is the resource unique (such as trophy trout fishery or old-growth forest), or common?

FWS is correct. When considering the section 10(j) recommendations for both listed versus non-listed species we do give additional considerations to species with a particular legal standing such as ESA listing over those that do not, as demonstrated by the third question above. However, our recommendations for individual resources are independent of one another and any measures recommended are done so to provide adequate protection of the specific resource while providing equal consideration for the water-power development.

Benthic Macroinvertebrate Monitoring

**Comment A-17:** Regarding the frequency in which benthic macroinvertebrates are monitored in project-affected stream reaches; Cal Fish & Game states that it did not make a recommendation for annual monitoring as stated in our January 14, 2009 10(j) letter. Cal Fish & Game also states that it supports our recommendation to monitor benthic macroinvertebrates during years 1, 2, 3, and 4, but for a maximum of 2 years per water year type, and also in years the resident fish monitoring is implemented. However, in its comments, FWS states that it does not support our recommended monitoring frequency and duration and continues to support its original recommendation specified in its 10(j) recommendation 8 to conduct monitoring efforts for the duration of the license term.

**Response:** In the draft EA we did not fully support adopting FWS, Cal Fish & Game, or NMFS' recommendations for benthic macroinvertebrate monitoring. As discussed in the

draft EA and this final EA, while we find it appropriate for PG&E to develop a benthic macroinvertebrate monitoring plan, we do not support the 10(j) agencies' recommendations for monitoring frequency. Based on our analysis, we find that sampling benthic macroinvertebrates in the same years as fish population monitoring would help to identify relationships between fish populations and the abundance of the aquatic macroinvertebrate prey base, improving the understanding of the relationship between environmental measures and aquatic productivity and would result in a better decision-making process. In the final EA, we find that monitoring the benthic macroinvertebrate populations for the duration of the license is typically excessive. We are, however, recommending, as discussed in section 5.2 and 5.4, that the benthic macroinvertebrate population monitoring be coordinated with our recommended resident fish monitoring efforts, and for the duration of the license term. For more detail, see section 5.2 and 5.4, and our response to comment A-14. **Comment:** NMFS comments that benthic macroinvertebrate monitoring should not only be tied to the resident fish population monitoring that follows operational changes in minimum instream flows, as we recommend, but that benthic macroinvertebrate monitoring should also follow other operational changes such as those that affect water temperatures.

**Response:** We agree with NMFS and have modified the text in the final EA to indicate that monitoring should be conducted following change in project operations or facilities that may influence a response in a target resource.

Spawning Habitat/Spring-run Chinook Distribution

**Comment A-18:** The Conservation Groups comment that many issues addressed in the draft EA are speculative in nature, including: (1) the amount and significance of downstream migration by spring-run Chinook salmon; (2) the significance of spawning habitat upstream and downstream of Centerville powerhouse; and (3) that the release of additional water into the Centerville bypassed reach will cause (over)crowding of fish. The Conservation Groups request that this speculation be removed from the final EA.

**Response:** During development of the draft EA, we did not speculate but utilized the best available scientific information to help formulate the analysis. This information included study results provided by PG&E, and any other relevant documents, including the preliminary Biological Opinion filed by NMFS with the Commission on November 28, 2006, Cal Fish & Game studies, and other available scientific studies and published literature.

**Comment A-19:** The Water Board states that FWS (2003) developed a 2D PHABSIM model to evaluate changes in flow on spawning habitat in Butte Creek that includes representative reaches above and below the Centerville powerhouse. The results of this study indicate there is more spawning habitat below the Centerville powerhouse, and by increasing flows a substantial increase in spawning habitat above the powerhouse would occur, substantially reducing redd superimposition. The Water Board comments that the

draft EA states increasing flows below Lower Centerville diversion dam could result in overcrowding and prevent the utilization of habitat below the Centerville powerhouse. The Water Board states it is not aware of any studies or substantial evidence that supports this statement and that the Commission should provide such evidence.

**Response:** Analyzing the various instream flow proposals and recommendations for lower Butte Creek is complex given the many variables and species present in this reach. In the final EA, we have updated the analysis regarding the amount and distribution of spawning habitat in lower Butte Creek as it relates to the proposed and recommended instream flow regimes. We recognize that providing additional instream flows at Lower Centerville diversion dam would provide additional spawning habitat for ESA-listed species, included spring-run Chinook salmon. We have also clarified in the final EA that providing the recommended instream flows during the spring-run Chinook salmon spawning period would be unlikely to impact water temperatures in lower Butte Creek as these flows would be provided outside of the warmer summer months. Although no formal studies were conducted to support our statements regarding overcrowding, given the biology of salmonids and their life histories, providing additional flows from Lower Centerville diversion dam may alter the distribution and relocation of salmonids after the summer holding period in lower Butte Creek, thus affecting the density of spawning salmon in certain stream reaches.

Essential Fish Habitat Consultation

**Comment A-20:** NMFS comments that (a) it is unclear if our conclusions regarding our determination that the licensing of the project as proposed with the additional staff recommended measures would not adversely affect essential fish habitat (EFH), also provides consideration of the mandatory conditions. Additionally, NMFS states that it is unclear how our conclusion on EFH can be substantially different from our conclusion under ESA where we found that the project may result in the incidental take of Chinook salmon or adversely affect their habitat.

**Response:** Our finding in the draft EA that the project as proposed with the additional staff recommended measures would not adversely affect EFH did not provide consideration for mandatory conditions because there are no mandatory conditions that when applied would have an effect on EFH. While this remains true, in the final EA, our finding on EFH now considers the project as proposed with staff recommended measures and the mandatory conditions. Additionally, as a result of NMFS' comments on our EFH analysis in the draft EA, we have revised our analysis in the final EA and now find that even with the benefits the project provides to the established Chinook salmon EFH, the project may still adversely affect the EFH as a result of an unanticipated shut-down of project facilities or other malfunctions. As a result, we now conclude that relicensing the project as proposed with staff recommended measures and the mandatory conditions may adversely the Chinook salmon's designated EFH within Butte Creek. As a result, with the

final EA, we are requesting consultation with NMFS pursuant to the Magnuson-Stevens Fishery Conservation and Management Act.

"Viability" Definition/Minimum Instream Flow Comments

**Comment A-21:** Page 72 of the draft EA states, "There are no estimates of the flow parameters for Long Ravine upstream of the discharge from Hendricks canal…" The Forest Service comments that as a result of this lack of data, it is not possible to determine what percentage of the natural flow is diverted into the Hendricks canal, and whether the current and the Commission's proposed instream flows are adequate to support viable rainbow trout populations downstream on National Forest System lands. The Forest Service requests that this statement be clarified.

**Response:** We note that trout were observed during the 2006 feeder creek habitat survey conducted in Long Ravine. Absent a fish stock program for Long Ravine, the presence of trout indicates a self sustaining naturally reproducing trout population. Please also see our response to Comment A-27.

**Comment A-22:** Page 362 of the draft EA states an instream flow of 2 cfs below Philbrook reservoir is adequate because "current rainbow trout populations in this reach are viable." The Forest Service comments that fish population data provided by PG&E shows that a total of 44 rainbow trout were observed downstream of the reservoir in 2006, which is equal to an average of approximately 403 trout per acre in Philbrook Creek. This number of fish is less than 50 percent of the 830 rainbow trout per acre recommendation we made for the West Branch Feather River that represents healthy Northern Sierra Streams as defined by the Forest Service and Cal Fish & Game. The Forest Service further comments that because there is no historical population data in Philbrook Creek, it is not possible to detect trends in the population, or make inferences whether this population is viable over time. The Forest Service requests the Commission to explain the basis for its viability assertion.

**Response:** We have revised our assertion in the final EA regarding the viability of trout populations within the stream reach downstream of Philbrook reservoir. Additionally, we note that in its modified 4(e) conditions, the Forest Service is no longer requiring trout population to be a minimum of 830 fish per acre as provided for in its preliminary 4(e) conditions. Instead, the Forest Service now states that it will develop the target population in consultation with PG&E. Following said consultation and the development of the target population, we note that 403 trout per acre may be an acceptable population density for this stream reach.

**Comment A-23:** The Forest Service comments that the analysis sections for Long Ravine, Cunningham Ravine, and Little West Fork (pages 178 through 180) in the draft state that, "… trout populations both above and below the feeder diversions are self sustaining." In addition, the draft EA states, "existing MIFs provide good water quality

with temperatures in the optimal range… and are similar both upstream and downstream of the diversion dam." The Forest Service comments that information provided by PG&E as part of the relicensing studies was limited to directly above and directly below the diversion for each of these tributaries and that information on the conditions found downstream on National Forest System lands was not provided. Thus, the statement regarding trout populations and water quality below the canal does not pertain to National Forest System lands. All observational data regarding aquatic conditions on National Forest System lands downstream, are the result of field visits to Little West Fork by Forest Service personnel in the spring of 2007. Furthermore, the Forest Service states that because it is unknown what percentage of the natural flow is diverted into Hendricks canal for each of these tributaries, the statement "PG&E's proposal to continue to release a MIF of between 0.25 and 0.1 cfs would continue to provide adequate habitat to maintain self-sustaining population of aquatic organisms…" is not accurate as it does not take into account the conditions that these systems evolved with below the diversion, including habitat on National Forest System lands.

**Response:** In developing our analysis of recommended measures for the project, including stream flow for the feeder creeks, we used the best available information. All of information provided indicates that water quality and temperature are within the optimal range for trout, both upstream and downstream of the diversion. The Forest Service has had ample opportunity to file information it has found relevant to this analysis and has not. We note that trout were observed during the 2006 feeder creek habitat survey conducted in Long and Cunningham ravines and in Little West Fork Creek. Absent a fish stock program for these creeks, the presence of trout indicates a self-sustaining naturally reproducing trout population; which supports our analysis that water quality is conducive to trout production. However, we do acknowledge that the information specific to the feeder creeks is limited; and therefore, we have revised the language in section 3 of the final EA to address what "appears" to be a self-sustaining viable population of trout. As a result of our analysis, in the final EA, we continue to find that PG&E's proposal to release the existing required minimum instream flows below the respective feeder creek diversion would continue to protect and maintain the existing aquatic organisms and their habitats.

Minimum Instream Flows

**Comment A-24:** NMFS comments that its 10(j) recommendation addressing instream flows downstream of Lower Centerville dam on Butte Creek would add thousands of square feet of additional habitat during spring-run Chinook salmon spawning, and is intended to reduce the crowding and high degree of redd superimposition previously observed. NMFS also comments the draft EA lacks analysis supporting a tradeoff of Butte Creek flows versus water temperatures.

**Response:** We acknowledge that NMFS' recommended instream flows for Lower Centerville diversion dam would provide additional habitat for spring-run Chinook

salmon compared to PG&E's proposal on pages 171 through 172 of the draft EA and provided an analysis of water temperatures within Butte Creek on pages 163 through 167. Additionally, we have provided additional analysis regarding the tradeoff of Butte Creek flows versus water temperatures in the final EA in section 3.3.2.2. Specifically, we note that instream flow recommendations at Lower Centerville diversion dam would be most likely to influence water temperatures during the summer months when spring-run Chinook salmon would be holding in Lower Butte Creek.

**Comment A-25:** The Forest Service requests the Commission update the discussion of instream flows in Philbrook Creek. The Forest Service believes its specified increase in instream flows for this reach contained in 4(e) condition 18.1 would improve trout spawning habitat in Philbrook Creek in years when water is available, while not adversely affecting either Philbrook reservoir storage or water temperatures in Butte Creek following interbasin transfer from the West Branch Feather River.

**Response:** As a result of additional information provided in comments on the draft EA, and at the section 10(j) meeting, we have updated our discussion in section 3.3.2.2 of the final EA regarding instream flows in Philbrook Creek. Additionally, as discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, of the final EA, we now support increasing instream flows in Philbrook Creek to 10 cfs in wet water years to Philbrook Creek between April 1$^{st}$ and May 15$^{th}$. Based upon this new information, we conclude providing this increase in instream flows would reduce spill flows in wet water years, thereby reducing downstream erosion, and providing additional habitat for resident trout.

**Comment A-26:** FWS comments it does not agree with the staff alternative which recommended instream flows for Butte Creek downstream of Lower Centerville diversion dam as proposed by PG&E rather than those recommended by FWS in 10(j) recommendation no. 2.1. FWS states its primary concern is that spawning habitat is limited in the reaches downstream of Lower Centerville dam. FWS points out that, depending on the water year, FWS' recommended instream flows (100 cfs normal and 75 cfs dry) would provide from about 8 to 29 percent more spawning habitat than the staff alternative. FWS states it concludes the substantial enhancement of spring-run Chinook salmon spawning habitat outweighs the slight reduction in hydropower generations given the importance of this ESA-listed species.

**Response:** We respectfully disagree with NMFS and maintain that the benefits of increasing spawning habitat for spring-run Chinook salmon in lower Butte Creek outweigh the costs of reducing power generation. In section 3.3.2.2 of the EA, we acknowledge that implementing FWS' 10(j) recommendation 2.1 would provide additional spawning habitat for spring-run Chinook salmon in lower Butte Creek compared to current conditions. However, our analysis indicates that NMFS' recommended instream flows would provide about an additional 6 to 10 percent weighted useable area (WUA) for spring-run Chinook salmon spawning habitat in the middle Butte

Creek sub-reach, and an additional 8 to 12 percent WUA for salmon spawning habitat in the lower Butte sub-reach compared to the staff alternative. We continue to conclude in section 5.2, *Comprehensive Development and Recommended Alternative* that the additional minimal gains in WUA for spring-run Chinook salmon spawning habitat associated with FWS' recommended instream flows do not justify the loss in generation of 4.4 gigawatt-hours (GWh), or approximately $383,00 in the annual net benefit.

**Comment A-27:** FWS comments that spawning habitat is likely limiting spring-run Chinook salmon populations in Butte Creek because of redd superimposition. FWS comments that redd superimposition could be reduced by increasing spawning habitat, which is contrary to statements made by the Commission in the draft EA. FWS states it believes providing additional flows downstream of Lower Centerville diversion dam would create additional spawning habitat both above and below the diversion dam, allowing salmonids to spread out throughout lower Butte Creek, reducing the adverse effects of overcrowding.

**Response:** We agree that based on the available literature, lower Butte Creek spring-run Chinook salmon populations currently exceed that which can be supported by the available habitat in this creek. We further agree with FWS that providing additional flows downstream of the Lower Centerville diversion dam would provide additional spring-run Chinook salmon spawning habitat, as stated on pages 366 through 367 of the draft EA, and as discussed in section 3.3.2.2 of the final EA. Under the staff alternative, instream flows and spawning habitat would be increased in lower Butte Creek compared to current conditions, thus helping to alleviate current over-crowding conditions. Although no formal studies were conducted to support our statements regarding overcrowding, given the biology of salmonids and their life-histories, providing additional flows from Lower Centerville diversion dam may alter the distribution and relocation of salmonids after the summer holding period in lower Butte Creek, thus affecting the density of spawning salmon in certain stream reaches.

**Comment A-28:** FWS comments that one of the reasons for modifying 10(j) recommendation 2.1 was based on the estimated costs for the recommendation. FWS does not believe that cost alone is a sufficient reason to deny a 10(j) condition and requests clarification how this 10(j) recommendation received equal consideration under section 4(e) of the FPA and to explain how the condition is inconsistent with the comprehensive planning standard of section 10(a). FWS comments it believes that its 10(j) recommendation 2.1 would provide the best balance for the protection of listed salmonids and other fish and wildlife resources in Butte Creek.

**Response:** We agree that costs alone are not sufficient reason to reject a section 10(j) recommendation. In making a determination of consistency, the needs of the resource in question are first evaluated. However, sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation, the protection, mitigation of damage to, and

enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality. Therefore, as was discussed in detail at the April 13, 2009, section 10(j) meeting, we take into consideration the needs of the resource, as well as the costs associated with any protection, mitigation, and enhancement measures needed, or recommended, for the resource.

**Comment A-29:** FWS comments that it does not accept the staff alternative which modified FWS' 10(j) recommendations 2.2 to 2.5 for instream flows downstream of Butte dam, Hendricks dam, Round Valley dam, and Philbrook dam. FWS does not believe that cost alone is a sufficient reason to deny a 10(j) condition and requests clarification how this 10(j) recommendation received equal consideration under section 4(e) of the FPA and to explain how the condition is inconsistent with the comprehensive planning standard of section 10(a). FWS comments it believes its 10(j) recommendation 2.1 would provide the best balance for the protection of listed salmonids and other fish and wildlife resources in Butte Creek and the West Branch Feather River.

**Response:** As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, based on new information provided since the issuance of the draft EA, we now support FWS' recommended instream flows downstream of Butte Creek diversion dam and in Philbrook Creek. Additionally, as further discussed in section 5.4, *Summary of Section 10(j) Recommendations and 4(e) Conditions*, as a result of the 10(j) process, resolution with FWS has been reached on instream flows for downstream of Hendricks diversion dam. We also note that the staff alternative in the draft and final EA supports FWS' recommended instream flows for downstream of Round Valley reservoir. However, for reasons discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, and our response to comments A-27 and 28, we continue to not support FWS' recommended instream flows for downstream of Lower Centerville diversion dam.

**Comment A-30:** FWS comments that with the exception of its recommendation for instream flows downstream of Helltown Ravine diversion structure, it does not agree with the staff alternative which does not support the instream flows recommended in 10(j) recommendation 2.6 for the feeder creeks (Inskip, Kelsey, Clear, Long Ravine, Cunningham Ravine, Little West Fork, and Little Butte creeks). Additionally, FWS comments it does not believe that cost alone is a sufficient reason to deny a 10(j) condition and requests clarification how this 10(j) recommendation received equal consideration under section 4(e) of the FPA and to explain how the condition is inconsistent with the comprehensive planning standard of section 10(a).

**Response:** We agree that costs alone are not sufficient reason to reject a section 10(j) recommendations (see response to comment A-29). As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, of the final EA, based on new information provided by the Forest Service, we revised the recommended instream flows for Inskip, Kelsey, Cunningham Ravine, and Little West Fork creeks in dry water

year types to 0.2 cfs. However, in the final EA, we continue to support the current instream flows for the remaining feeder diversions in dry and normal water year types. We continue to conclude in the final EA that our recommended minimum instream flows, which are consistent with existing instream flow requirements, except for the modification previously noted, would continue to protect water quality and support aquatic species in these reaches, and that the minor additional benefits associated with FWS' recommended minimum instream flows would not justify the increased costs.

**Comment A-31:** Cal Fish & Game comments that our assertion that its recommended instream flows would best provide a balance between creating additional habitat and maintaining, or reducing, instream water temperatures for the benefit of these aquatic species is not supported by the evidence presented in the draft EA. Cal Fish & Game further comments that our recommended instream flows at the main project diversions do not provide sufficient fish habitat, including spring-run Chinook salmon habitat, and that its recommended flows accomplish these objectives.

**Response:** See our response to comments A-25 through A-32.

**Comment A-32:** Cal Fish & Game comments that it does not agree with our conclusion that Cal Fish & Game's 10(j) recommendations addressing instream flows may be inconsistent with the comprehensive planning standard of section 10(a) and the equal consideration provision of section 4(e) of the FPA, based primarily on the difference in annualized cost between our recommended flows and Cal Fish & Game's recommended flows. Cal Fish & Game states that it believes the costs associated with these instream flows are not unreasonable.

**Response:** Please see our response to comment A-29.

<u>Water Year Type/Drought Conditions</u>

**Comment A-33:** The Forest Service comments it supports PG&E's suggestion and the Commission's support of a minor adjustment to 4(e) language concerning triggering of water year type implementation based on the actual release date of the state publication of Bulletin 120 instead of an expected release date of that document. The Forest Service states that it also concurs with the slight modification of dates for PG&E to contact resource agencies regarding drought conditions as proposed by PG&E and recommended by the Commission and with shifting consultation with resource agencies from May 1 to May 15 of the same year.

**Response:** We note the Forest Service's support of these modifications in the final EA.

**Comment A-34:** FWS comments that it accepts our recommendation that the licensee file any revised drought plans with the Commission for approval, prior to implementation. FWS states this was the intent of its recommendation.

**Response:** We note FWS' support of these recommendations in the final EA.

**Comment A-35:** Cal Fish & Game comments that the Commission's Preliminary Determination of Inconsistency letter filed January 14, 2009, states, "we recommend adopting your recommendations for PG&E to notify the resource agencies of drought concerns by March 10 of a second or subsequent dry water year, and for PG&E to consult with the resource agencies by May 1 to discuss operational plans to manage Project operations during drought conditions." However, Cal Fish & Game comments that page 189 of the draft EA indicates that we support a slight modification to these dates, which Cal Fish & Game states is acceptable. Cal Fish & Game requests clarification on our recommendation regarding its 10(j) recommendation 8.

**Response:** Our Preliminary Determination of Inconsistency letter referenced the incorrect date as noted by Cal Fish & Game. As discussed on page 372 of the draft EA, we recommend a slight modification to Cal Fish & Game's 10(j) recommendation 8. We recommend that PG&E notify the resource agencies of drought concerns by March 15 of a second or subsequent dry water year, and that consultation with the resource agencies occur by May 15 of the same year.

Stream Flow Gages

**Comment A-36:** Cal Fish & Game comments that we did not support its recommendation for the installation of three additional stream flow gages, if deemed necessary, based on the outcome of annual consultation and adaptive management. We were unable to analyze this recommendation because details concerning these gages, including their location and justification for them, were not given. Cal Fish & Game states this measure was meant to address adaptive management and that determining the costs or locations of these gages is not possible. Cal Fish& Game comments that it is concerned if additional stream gages are needed in the future, the Commission would not require them unless it is called out in a license term; however, Cal Fish & Game says addressing this issue in the adaptive management plan would also be an acceptable alternative.

**Response:** As discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, of the final EA, as a result of additional information provided in Cal Fish & Game's letter filed February 27, 2009, and discussions at the section 10(j) meeting, we now recommend that these three stream flow gages be included in our recommended adaptive management program.

**Comment A-37:** FWS comments that it concurs with our recommendation not to support FWS' 10(j) recommendation condition 17, which recommends new stream flow gages at each of the feeder creek diversions. FWS comments that it also supports tour recommendation to utilize roving operators to ensure the feeder creek diversions are functioning as designed and providing all required instream flows.

**Response:** In the final EA, we have noted your acceptance of our recommendation to utilize roving operators.

Long-term Operations Plan

**Comment A-38:** NMFS comments that it anticipates more discussion with Commission staff during the 10(j) resolution meeting to discuss issues relating to its 10(j) recommendation no. 8, including our recommendation to not support the installation of remote operating equipment at the Round Valley and Philbrook reservoirs as part of a long-term project operations plan.

**Response:** During the section 10(j) meeting, NMFS stated that its main concern was PG&E's ability to quickly respond to heat events, and increase flows from Philbrook reservoir during summer months. PG&E stated during the meeting that in the summer, adjustments to the valve releasing water from Philbrook reservoir are usually done in consultation with the resource agencies and that adjustments to the release valve can be accomplished within 2 hours. As a result of this clarifying information, NMFS withdrew this recommendation.

**Terrestrial Resources**

Bald eagles

**Comment T-1:** The Forest Service recognizes that bald eagle surveys every 3 years, as we recommended, may be adequate as long as there are no management changes made during the new license term that further reduce or eliminate the 250-acre-foot minimum pool at Philbrook reservoir. The Forest Service believes that the future monitoring plan should address triggering additional monitoring if project management actions alter foraging habitat, such as the reduction of this minimum pool, or if observations of eagles become more common, as we state in draft EA. FWS commented that our recommendation to monitor bald eagles once every 3 years and more frequently if eagle nesting is detected as compared to its recommendation for annual surveys is acceptable.

**Response:** We agree that actions during the term of the license that may adversely affect eagle foraging or nesting could trigger the need for more frequent surveys, as well as increased eagle use of the project area. We have modified our recommendation to be consistent with the Forest Service recommendation. Sections 3.3.3 and 5.2.2 of the EA have been modified to reflect the Forest Service's modified recommendation and FWS' acceptance of our recommended survey frequency.

Yellow-legged frogs

**Comment T-2:** FWS believes that the sampling we recommended (annually in years 1 through 3; every 3 years for remainder of license term) is not high enough to provide sound biological data to monitor the population. As an alternative, FWS proposes a

revised schedule that includes 15 years of sampling (annually in years 1 through 4 and last 4 years of license; seven surveys spaced evenly through remaining years of license). FWS also reiterates its concern that a population viability analysis is necessary because of the unknown role hydropower operations play on yellow-legged frog populations in the project area.

**Response:** Although a population viability analysis provides an additional tool to assess the long-term survival of a population and additional sampling would provide greater precision, as discussed in section 3.3.3 and 5.2.2, our recommended monitoring and data collection measures would provide quantitative information to determine project effects on population size, distribution, development rates, and habitat characteristics and would be more cost effective than the FWS recommendation.

**Recreational Resources**

Annual Fish Stocking

**Comment R-1:** In its comments, Cal Fish & Game seeks clarification of our recommendation for the licensee to prepare a fish stocking plan. Specifically, they question whether the number of fish to be stocked would be based on our estimated cost of $22,000 annually or equivalent to 7,200 pounds of fish, regardless of cost. Cal Fish & Game correctly notes that $22,000 equals today's cost of $3.02 per pound to raise the fish, and states that if it is our intent that the licensee be responsible for the stocking of 7,200 pounds of fish into project waters this recommendation is acceptable to them. However, if our recommendation is for the funding of $22,000 annually for fish stocking regardless of the cost to raise the fish, this would not be acceptable to Cal Fish & Game.

**Response:** To clarify, it is our recommendation that the licensee be responsible for the stocking of 7,200 pounds of fish into project waters annually, regardless of the cost to raise the fish. We use an annual cost of $22,000, in today's dollars to estimate the annual cost of this measure over the term of any new license issued.

**Comment R-2:** The Forest Service comments that the Commission misunderstood the intent of Forest Service condition 33 for the licensee to develop a recreation trail from a Forest Service constructed parking area to Philbrook reservoir on the southeast shoreline within the project. The Forest Service clarifies the intent of this condition is to clearly indicate, via a pathway, where it is appropriate for the public to travel to get from the Forest Service provided parking area(s) (please refer to section 3.3.5.2, *Recreation Resources* of the final EA) to the project shoreline, through the private cabins, decreasing conflicts with the private cabin owners. The Forest Service notes that these trail(s) are not for the convenience of the private cabin owners.

**Response:** We appreciate the clarification and have revised the text in section 3.3.5.2, Recreation Resources, of the final EA to reflect the intent of Forest Service condition 33.

We acknowledge the Forest Service's intent of the condition to clearly identify a pathway for public use to the project shoreline from three new Forest Service access roads and public parking areas that will be constructed by the Forest Service as a part of a timber sale. After further analysis, we have determined that providing public access from these parking areas to the south east shoreline of Philbrook reservoir would improve access at the project. We agree with the Forest Service and have revised the text in section 3.3.5.2, *Recreation Resources*, of the final EA.

**Comment R-3:** The Forest Service recommends that the Commission support the specified 15-20 percent recreation fee retention in Forest Service condition 33. The Forest Service is concerned that without any way for the Forest Service to secure alternate funding for these facilities, the Forest Service would not be able to provide interpretive programs or other opportunities at this facility that are not addressed by the license condition. Due to the small size of the campground, 15 to 20 percent of the fees are expected to be less than $3,000 per year.

**Response:** We noted on section 3.3.5.2, *Recreation Resources*, of the draft EA that although all of the campsites at Philbrook Campground, with the exception of one, are located on National Forest System lands, because the entire campground is within the project boundary, PG&E has been and continues to be responsible for the operation and maintenance of these campsites within the project boundary. Therefore, any use of the camping fees collected would be under the jurisdiction of the licensee. In addition, although providing interpretive programs at Philbrook Campground would enhance the public's knowledge and use of the recreation resources at the project, the campground has an occupancy rate of only 34 percent year round. Therefore, we do not feel it necessary to require interpretive programs at the campground as a part of the license, nor do we feel it appropriate to require PG&E to provide funding to the Forest Service for such programs.

**Comment R-4:** The Forest Service comments it is concerned with existing moderate user conflicts between boats and other users on Philbrook reservoir and a sudden increase in use (including boating) at the project following the paving of Skyway Road. Given these concerns, the Forest Service recommends a quick annual check on boating trends, which could easily be conducted by the Philbrook Campground host, with a mechanism to trigger a review at less than the 5-year monitoring interval if there is a sudden increase in boating use, accident rates, or user conflicts.

**Response:** We recognize the Forest Service's concerns with existing and future conflicts between boaters and other users on Philbrook reservoir. We agree that an annual boating count, in addition to the recreation monitoring every 5 years, with a mechanism to trigger review in case of a sudden increase in use or incidents would help identify excessive use and eliminate potential user conflicts. After further analysis, we have revised the text in section 3.3.5.2, *Recreation Resources*, of the final EA.

**Comment R-5:** Butte County recommends the second sentence of the first paragraph on page 277 be rewritten to provide the following information:

"A projected twofold increase in the number of visitors over the term of the new license will very likely increase the need for public safety services, including law enforcement/search and rescue services, which are provided by/through the Butte County Sheriff's Office, and fire prevention, protection and suppression services, which are provided by CAL FIRE/Butte County Fire Department."

**Response:** We have modified the text in the final EA to reflect the increase of project visitation over the term of the license.

**Comment R-6**: The Water Board comments that when Philbrook reservoir is drawn down, vehicles must navigate between large rocks in a circuitous path to reach the reservoir, which results in erosion in the exposed lake bottom, thus increasing the potential for the release of petroleum products onto the reservoir bottom. The Water Board recommends extending the boat ramp to reduce the potential for impacts to water quality that currently exist at Philbrook reservoir.

**Response:** The Forest Service specified the concrete boat launch be extended on Philbrook reservoir in Forest Service condition 33. Our analysis on page 269 of the draft EA indicated that the demand for boating access coupled with the current condition of the boat launch demonstrates the need for adequate recreational boating access at the project. We agreed with the Forest Service recommended measure as a part of our staff alternative in the draft EA.

**Comment R-7:** The Forest Service comments that while the 4(e) condition 33 contains an element for "Project Patrol," it does not require this person to be of law enforcement status. Therefore, because the Forest Service is not requiring law enforcement, which the Commission considers to be the responsibility of the state and county, the Forest Service recommends the EA be rewritten to provide for project patrol.

Butte County also recommends the analysis under the section of Law Enforcement on page 276 of the EA be revised to recommend the license condition for Project Patrol, as specified by the Forest Service, in order to assist the public, facilitate public access, assure compliance, perform minor maintenance, extinguish campfires, and generally facilitate public safety and resource protection. A project patrol person could contact County Public Works regarding litter and unlawful dumping issues associated with the project and additionally could assist in opening and closing gates, thus avoiding the need to set up a selective key distribution protocol associated with the licensee providing restricted stream access to DeSabla and Centerville powerhouses. Butte County additionally states that many other project licensees, including the California Department of Water Resources, which operates the nearby Lake Oroville Project, employ or fund a

project safety-security staff and this has become an industry standard for utilities since 9/11.

**Response:** We acknowledge that other project licensees have employed or funded project safety or security staff, such as the California Department of Water Resources who has a special payment arrangement with the Butte County Sheriff's Office to patrol a portion of the project at Lake Oroville. However, these have been arrangements or agreements made outside of the license. The Commission has no way of ensuring that the hiring of personnel paid for by the licensee (in this case funding a seasonal employee), actually would accomplish a project purpose or ameliorate a project effect. However, the Commission can enforce specific measurable actions, such as operations and maintenance measures, such as maintenance of project lands and project recreation facilities to address litter and other associated potential effects of dispersed recreation use within the project boundary. While improved implementation of Forest Service and County standards and guidelines regarding recreational use would be beneficial, enforcement of those regulations would be outside the jurisdiction and responsibility of the licensee. In the project area, law enforcement duties fall to the Butte County Sheriff's office, the California Highway Patrol, and federal agencies on federal lands.[92]

**Land Use and Aesthetic Resources**

**Comment L-1:** The Forest Service recommends that the West Branch Feather River road crossing (designated as BW45 road on table 3-42 on page 3-285 in the EA) be designated as a project road by the Commission and that it be added along with other facilities (such as project spill channels, as discussed in the draft EA) as a boundary adjustment if a new license is issued. The licensee said they use this road to access the gage below Round Valley reservoir when spill does not allow access across the dam. The Forest Service comments since the only reason to keep this road open is to allow the licensee project access, it therefore recommends this road be included in the project boundary.

**Response:** We agree with the Forest Service and have modified the text in the final EA to include BW45 Road within the project boundary.

**Comment L-2:** The Forest Service comments that many of the roads used specifically to access the project for inspection, operation, and maintenance, as well as for public access, are currently located partially or wholly outside the project boundaries and asserts that the licensee is responsible for project-related costs where a nexus exists, including recreation use induced by the project reservoir. The Forest Service recommends

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[92] The Forest Service provides law enforcement to address illegal activities that take place on National Forest System lands, such as illegal dumping of trash and hazardous materials, drug production lab debris, and vandalism of cultural resource sites.

concerns with project nexus roads be clarified and that appropriate roads be included in the project boundary.

The Forest Service also comments that some of the other roads listed in Table 3-42 are not currently within the FERC project boundary because they are not used exclusively for project operations; however, some provide the only access to project facilities. The Forest Service comments these roads are key to continuing project operations as well as accommodating project-induced recreational traffic. The Forest Service recommends the paragraph on page 3-285 of the EA be rewritten to more accurately describe these roads and the project nexus for operational access.

Additionally, Butte County recommends that both the road maintenance paragraph on page 284 and the road maintenance analysis paragraph on page 285 be revised to more accurately describe all of the roads set forth in Table 3-42 and the project nexus for operational access. Butte County recommends the Commission consider expanding the project boundary in the areas adjacent to project access roads to more realistically reflect project access needs and project-induced impacts on local infrastructure.

**Response:** There are four roads listed in Table 3-42 are not within the project boundary. Two of these roads, the Philbrook Cabin Driveways and Philbrook Road from Humbug Road to the last lessee cabin driveway, are not being used for project purposes nor do they lead to project facilities. Humbug Summit Road is a county road that goes through the project, but again, is not used primarily for project purposes. The Commission's policy requires PG&E to be responsible for road maintenance, whether for project operations, maintenance, or project-induced recreation access, for those roads that are required primarily for project purposes, as stated on page 283 of the draft EA. As stated above, we agree with the Forest Service and have modified the text in the final EA to include BW45 Road within the project boundary. We will also modify the text on page 284 to more accurately describe all of the roads listed in table 3-42 in the final EA.

**Comment L-3**: The Forest Service comments the third paragraph on page 3-281 is confusing. The paragraph states, "Philbrook reservoir, located near the head of Philbrook Creek, is roughly 35 miles downstream of Round Valley reservoir . . ". The Forest Service comments that Philbrook reservoir is on a separate waterway (Philbrook Creek, not the West Branch Feather River) so it is not downstream, and additionally, it is much closer than 35 miles to Round Valley reservoir. It also comments that the first sentence under Project River Reaches on page 282 of the EA states, "West Branch Feather Reach flows 20 miles from Philbrook reservoir to Miocene Diversion . . ". The Forest Service clarifies that Philbrook reservoir is not located directly on the West Branch Feather River and the text should be corrected to Round Valley reservoir and "reach" should be changed to "river." The Forest Service recommends the text be corrected.

**Response:** We have modified the text in the final EA to reflect these corrections.

**Comment L-4**: The Forest Service comments the first sentence under Project River Reaches on page 282 of the EA states, "West Branch Feather Reach flows 20 miles from Philbrook reservoir to Miocene Diversion . . ". The Forest Service clarifies that Philbrook reservoir is not located directly on the West Branch Feather River and the text should be corrected to Round Valley reservoir and "reach" should be changed to "river".

**Response:** We have modified the text in the final EA to reflect these clarifications.

**Comment L-5:** Butte County comments that the EA does not include a recommendation consistent with the Forest Service 4(e) condition 36 to require the licensee to include the county in the transportation system management plan and to consult and cooperate with the county. Butte County recommends the Commission impose a license condition requiring the licensee to develop a cooperative road agreement with all appropriate parties, including Butte County and the Forest Service. Butte County states the goal of the agreement would be to establish each party's proportionate road share costs and identify project-specific public safety, resource protection, and erosion control mitigations to be performed by the licensee. The Water Board recommends the transportation system management plan should require approval of the state and regional Water Boards and Butte County, in addition to the Forest Service, because some of the roads in the Butte Creek drainage are not located on federal lands.

**Response:** We do not recommend a license condition requiring development of a cooperative road agreement. The Commission policy would require PG&E's responsibilities to solely maintain those roads and trails that are required primarily for project purposes and would include these facilities in the project boundary. PG&E, the Forest Service, and Butte County may enter into a variety of arrangements with other entities to provide for road and trail maintenance as they so choose. However, we do agree that PG&E should consult with the appropriate agencies on the transportation system management plan. We have modified the text in the final EA to include consultation with the state and regional Water Boards, Butte County, and the Forest Service on our recommended transportation system management plan for all project roads.

**Comment L-6:** Butte County recommends that, at minimum, the Commission require the licensee to furnish, install, and maintain temporary traffic controls to provide the public with adequate warning and protection from hazardous or potentially hazardous conditions associated with project operations or when the licensee is conducting any construction activities adjacent to or on county-maintained roads open to public travel.

**Response:** The Forest Service's condition 36 specifies the use of temporary traffic controls during any project construction or operation activities that could be potentially hazardous in Forest Service condition 36. After analysis, we stated on page 285 of the draft EA that implementing temporary traffic controls would ensure adequate access and public safety are provided during the construction of the project. As a result, we are

recommending this measure as a part of our staff alternative and we are expanding condition 36 to include all lands within the project boundary.

**Comment L-7:** Butte County comments that page 3-265 of the draft EA indicates that project use will double over the next 41 years and a doubling of project use will result in significant impacts to county-maintained, unsurfaced roads serving project facilities, such as Philbrook Road, Humbug Summit Road, Centerville Road, Powellton Road, Retson Road, and Doe Mill Road. Butte County states it appears only a small portion of these impacts are addressed in the transportation system management plan. Butte County also comments that Table 3-42 on page 284 of the draft EA indicates that Humbug Road and Humbug Summit Road are located outside the project boundary, as well as Skyway, Centerville, Nimshew, Doe Mill, Powellton, and Reston roads on page 285 of the draft EA. Butte County states these assertions are incorrect. Maps provided by the licensee indicate that portions of Humbug Road within the area between the Lower Centerville diversion dam and Toadtown canal and the portion of Humbug Summit Road which passes directly alongside Round Valley reservoir are both within the project boundary. Butte County recommends the EA should be corrected to include these roads within the project boundary and that table E6.1.2.1-3 from the License Application, Final Filing, Volume IIA, pages E6.1-10 through E6.1-13, be amended to indicate county-recommended project-affected road reconstruction and maintenance and be inserted in the final EA. Additionally, the Water Board recommends the transportation system management plan should require approval of the state and regional Water Boards and Butte County, in addition to the Forest Service, because some of the roads in the Butte Creek drainage are not located on federal lands.

**Response:** We appreciate the clarification and have modified the text in the final EA to accurately describe where portions of the above roads enter and exit the project boundary. The Commission's policy would require PG&E's to solely maintain those roads and trails that are required primarily for project purposes and would include these facilities in the project boundary. All of the aforementioned roads are currently maintained by the county and are not primarily being used for project purposes. Therefore, we would not include each road in its entirety into the project boundary. Furthermore, we do not feel it necessary to amend table E6.1.2.1.1-3 or include it in the final EA. However, we do agree that PG&E should consult with the appropriate agencies on the transportation system management plan. We have modified the text in the final EA to include consultation with the state and regional Water Boards, Butte County, and the Forest Service on the transportation system management plan for all project roads.

**Cultural Resources and Historic Properties**

**Comment C-1:** The Forest Service comments that "it is not clear if FERC is requiring the [l]icensee to continue consultation now in order to develop a more complete document, or just suggesting that over the years as consultation continues the inclusion of specific details (as requested by [the Forest Service] and others) would be added as

developed, eventually resulting in an improved document." The Forest Service goes on to state that while the draft EA recommends implementing PG&E's HPMP with five additional management measures, none of the additional measures "…include consultation with interested parties to convert this draft template into a project-specific plan, as [the Forest Service] was told by the [l]icensee."

**Response:** While the HPMP filed by PG&E on February 15, 2008, is labeled as a draft document, it includes numerous protocols for continued consultation with the California SHPO, the Forest Service, BLM, and the participating tribes. While we understand the desire to hold additional consultations prior to calling the HPMP a final document, staff notes consultation protocols contained within the February 2008 HPMP would address the issues brought forth by the Forest Service and other commenting parties. As such, we continue to recommend implementation of the many beneficial measures contained with the February 2008 HPMP and use the consultation, review, and revision measures already incorporated within the HPMP to address any outstanding issues and issues that may arise throughout the term of any license issued for the project.

**Comment C-2:** In response to the statement on page 311 of the draft EA that PG&E currently is working with the Commission's Division of Hydropower Administration and Compliance on mitigation measures for a historic site within Round Valley reservoir, the Forest Service requests that the Commission "assure that the licensee seeks [Forest Service] involvement and approval prior to approving any measures on National Forest System Lands.

**Response:** As stated in section 5.2.2 of the final EA, we recommend that the mitigation measures associated with the Lake Tenders Cabin and the site within Round Valley reservoir be included in the HPMP. In turn, section 4.13 of the HPMP contains language stating that PG&E will consult with the Forest Service, as necessary, if monitoring detects any activities or site damage on National Forest System lands in order to initiate appropriate actions or develop appropriate mitigation measures. This language implies that PG&E will seek Forest Service approval before implementing any measures on National Forest System lands; however, we note the Forest Service's comment and acknowledge that the Forest Service is welcome to address its needs as it sees fit.

**Comment C-3:** The Forest Service notes that table 3-43 on page 289 of the draft EA needs to clarify the locations of three areas not surveyed during the archaeological survey.

**Response:** The first location, listed in table 3-43 as "FWS of Philbrook reservoir" has been corrected in the final EA to read "Interior of Philbrook reservoir." In regard to the other two locations, this table was taken directly from PG&E's license application. To identify the exact locations referenced here, please refer to appendix A of PG&E's February 2008 HPMP, which was filed with the Commission on February 15, 2008.

**Comment C-4:** In a February 25, 2009, letter, the Forest Service comments on the Commission's January 30, 2009, draft Programmatic Agreement. While most of the comments contained within that letter specifically address the contents of the Programmatic Agreement, some of the comments deal with our recommendations concerning cultural resources. The Forest Service notes that the recommended management measures attached to the Programmatic Agreement (and contained within section 5.2.2 of the draft EA) do not specify a date when the recommended information should be incorporated into the February 2008 HPMP. The Forest Service notes that its 4(e) condition 35 contains a one-year timeframe for filing a finalized HPMP.

**Response:** We have modified the text in the final EA to include a recommendation that the missing information be incorporated into the February 2008 HPMP within 60 days of any license issued for the project.

**Comment C-5**: In its February 25, 2009, letter, the Forest Service recommends that the second additional measure contained within the Commission's recommendations in section 5.2.2 of the draft EA include clarification that all artifacts from NFS lands remain property of the Forest Service.

**Response:** We have modified the text in the final EA to reflect this clarification.

**Comment C-6:** In its February 25, 2009, letter, the Forest Service recommends amending the fifth measure (i.e., Include mitigations for Round Valley reservoir…") contained within the Commission staff's recommendations in section 5.2.2, to state, "…and other sites as determined necessary during consultation with applicable agencies and Tribes." Additionally, the Forest Service states that any planned adverse or no adverse effect mitigation on sites located on NFS lands needs to include a Memorandum of Agreement between the parties (including the Forest Service) and the SHPO.

**Response:** We have modified the text in the final EA to reflect these recommended amendments. In reference to the Memorandum of Agreement, we do not see the necessity of such a document. It is our conclusion that adequate provisions exist within the PA and the HPMP to address the development of such mitigation measures.

**Project Economics**

**Comment E-1:** FWS comments that on pages 401 through 412 (Tables 5-3 and 5-4) a transparent cost analysis was not provided that allows for a determination on how cost estimates were developed. FWS further states that our cost estimates are confusing because costs were often provided in relative terms, or in "so many dollars greater than the staff alternative's cost," and that cost estimates for the various instream flows by stream reach were not presented. On May 5, 2009, Cal Fish & Game also requested that we provide clarification of how staff's cost estimates were developed in the draft EA.

**Response:** In section 4.1 of the draft EA, we provide the parameters that we used in developing our economic analysis for the DeSabla-Centerville Hydroelectric Project. Also, table 4-3 provides a summary of the capital costs, annual costs, annual energy costs, and total annualized costs of the different environmental measures we looked at in the draft EA. On June 4, 2009, we responded to Cal Fish & Game's request. In our letter we further explained that, with respect to project economics, we prepare an economic analysis of projects over a 30-year period based on the current value of electric power, keeping with Commission policy as described in the Commission's Mead decision.[93] We also noted that our economic analysis takes into account federal, state, and local taxes; depreciation; insurance; and interest during construction. Regarding FWS' assertion that the draft EA did not present cost estimates for the various minimum instream flow releases by stream reach, we disagree. In section 4.3.1 of the draft EA, we presented the incremental increase in cost of providing the recommended minimum instream flows over PG&E's proposed flows. In the final EA we present the cost of these flows in section 4.0.

[93] See 72 FERC ¶ 61,027 (July 13, 1995).

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# APPENDIX D

## Existing Water Rights on Butte Creek and West Branch Feather River

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Table D-1. Existing water rights on Butte Creek and West Branch Feather River with potential to affect or be affected by the DeSabla-Centerville Project. (Source: PG&E, 2004)

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| A000476 | 271 | | 9/21/1916 | Little Butte Creek | Butte Creek | 9,500 | 0 |
| A000476 | 271 | | 9/21/1916 | Little Butte Creek | Butte Creek | 9,500 | 0 |
| A002755 | 2006 | 988 | 2/9/1922 | Philbrook Creek | West Branch Feather River | 5,060 | 0 |
| A002909 | 2027 | 1029 | 6/27/1922 | Butte Creek | Butte Slough | 0 | 20 CFS |
| A004989 | 2706 | 837 | 4/7/1926 | West Branch Butte Creek | Butte Creek | 0 | 2.53 CFS |
| A005109 | 3210 | 2614 | 7/17/1926 | Butte Creek | Butte Slough | 0 | 20 CFS |
| A005110 | 3211 | 2615 | 7/17/1926 | Butte Creek | Butte Slough | 0 | 20 CFS |
| A006723 | 3634 | 2560 | 7/8/1930 | Empire Creek | West Branch Feather River | 0 | 3 CFS |
| A008187 | 4699 | 2616 | 12/1/1934 | Butte Creek | Butte Slough | 0 | 100 CFS |
| A008188 | 4700 | 2617 | 12/1/1934 | Butte Creek | Butte Slough | 0 | 100 CFS |
| A008422 | 4644 | 2423 | 8/21/1935 | Ogden Creek | West Branch Feather River | 0 | 16000 GPD |
| A008422 | 4644 | 2423 | 8/21/1935 | Ogden Creek | West Branch Feather River | 0 | 16000 GPD |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| A008559 | 4743 | | 2/19/1936 | Big Butte Creek | Butte Slough | 0 | 50 CFS |
| A008565 | 4744 | | 2/27/1936 | Big Butte Creek | Butte Slough | 0 | 50 CFS |
| A009735 | 5847 | | 2/22/1939 | Big Butte Creek | Butte Slough | 0 | 50 CFS |
| A009736 | 5848 | | 9/22/1939 | Big Butte Creek | Butte Slough | 0 | 50 CFS |
| A015866 | 10390 | 9267 | 5/10/1954 | Butte Creek | Sacramento River | 0 | 5.9 CFS |
| A015867 | 10391 | 9268 | 5/10/1954 | Butte Creek | Butte Slough | 0 | 5.9 CFS |
| A018780 A | 12104 | 6940A | 6/9/1959 | UNSP | Little Butte Creek | 0 | 960 GPD |
| A018780 B | 12104 | 6940B | 6/9/1959 | UNSP | Little Butte Creek | 0 | 960 GPD |
| A018780 C | 12104 | 6940C | 6/9/1959 | UNSP | Little Butte Creek | 0 | 960 GPD |
| A020429 | 13430 | 8025 | 10/6/1961 | UNSP | UNST | 0 | 7200 GPD |
| A022061 | 16040 | | 2/25/1965 | Little Butte Creek | Butte Creek | 8,800 | 0 |
| A022534 | 16022 | 10432 | 7/27/1966 | Butte Creek | Butte Slough | 0 | 8 CFS |
| A022564 | 16029 | 10433 | 8/29/1966 | Butte Creek | Butte Slough | 0 | 2.33 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| A022864 | 15752 | 10214 | 7/28/1967 | UNSP (2) | Little Butte Creek | 0 | 0.075 CFS |
| A023298 | 15950 | 10194 | 6/17/1969 | Little Butte Creek | Butte Creek | 45 | 0 |
| A023298 | 15950 | 10194 | 6/17/1969 | Little Butte Creek | Butte Creek | 45 | 0 |
| A023875 | 16631 | 10806 | 9/24/1971 | Dix Butte Mine | UNST | 0 | 900 GPD |
| A025967 | 18068 | | 4/9/1979 | Little Butte Creek | Butte Creek | 0 | 10 CFS |
| A027815 | 20227 | | 7/28/1983 | Butte Creek | Butte Slough | 0 | 250 CFS |
| A028567 | 20052 | 13249 | 10/2/1985 | UNSP | UNST | 0 | 600 GPD |
| A028663 | 20458 | 13250 | 12/18/1985 | UNSP | UNST | 0 | 0.09 CFS |
| A029251 | 20457 | 13251 | 5/25/1988 | UNSP | UNST | 0 | 0.223 CFS |
| A029580 | 20498 | | 10/2/1989 | UNSP | UNST | 100 | 0.05 CFS |
| A029619 | 20949 | | 11/24/1989 | UNSP | UNST | 0 | 0.09 CFS |
| A029619 | 20949 | | 11/24/1989 | UNSP | Butte Creek | 0 | 0.09 CFS |
| A029913 | | | 3/7/1991 | Butte Creek | Butte Slough | 52 | 0 |
| A031413 | | | 4/15/2003 | Butte Creek | Sacramento River | 0 | 25 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| F003379S | | | 1/1/1967 | UNSP | Philbrook Creek | 0 | 100 GPD |
| F005181S | | | 1/1/1970 | UNSP | West Branch Feather River | 0 | 0 |
| S000888 | | | 6/17/1967 | West Branch Feather River | Feather River | 1196 | 0 |
| S000889 | | | 6/17/1967 | West Branch Feather River | Feather River | 0 | 125 CFS |
| S000890 | | | 6/17/1967 | Butte Creek | Sacramento River | 0 | 95 CFS |
| S000891 | | | 6/17/1967 | Butte Creek | Sacramento River | 0 | 180 CFS |
| S000892 | | | 6/12/1967 | West Branch Feather River | Feather River | 0 | 75 CFS |
| S000893 | | | 6/12/1967 | Inskip Creek | Butte Creek | 0 | 5 CFS |
| S000897 | | | 6/12/1967 | Kelsey Creek | Butte Creek | 0 | 2 CFS |
| S000901 | | | 6/12/1967 | Clear Creek | Butte Creek | 0 | 40 CFS |
| S000911 | | | 1/12/1967 | Long Ravine | West Branch Feather River | 0 | 130 CFS |
| S000912 | | | 6/12/1967 | Little West Branch | West Branch Feather River | 0 | 5 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S000913 | | | 6/12/1967 | Cunningham Ravine | West Branch Feather River | 0 | 5 CFS |
| S000916 | | | 6/12/1967 | UNST | West Branch Feather River | 0 | 3 CFS |
| S000917 | | | 6/12/1967 | Helltown Ravine | Butte Creek | 0 | 180 CFS |
| S001251 | | | 6/23/1967 | West Branch Feather River | Feather River | 9.3 | 12.25 CFS |
| S001252 | | | 6/23/1967 | Little Butte Creek | Butte Creek | 0 | 0.5 CFS |
| S001252 | | | 6/23/1967 | Little Butte Creek | Butte Creek | 0 | 0.5 CFS |
| S001253 | | | 6/23/1967 | Griffin Gulch | West Branch Feather River | 0 | 1000 GPD |
| S001254 | | | 6/23/1967 | Empire Creek | West Branch Feather River | 0 | 1000 GPD |
| S001258 | | | 6/23/1967 | Fall Creek | West Branch Feather River | 0 | 1000 GPD |
| S001259 | | | 6/23/1967 | Fall Creek | West Branch Feather River | 0 | 1000 GPD |
| S001260 | | | 6/23/1967 | Fall Creek | West Branch Feather River | 0 | 1000 GPD |
| S001268 | | | 6/23/1967 | West Branch Feather River | Feather River | 0 | 1000 GPD |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S001276 | | | 6/23/1967 | Kanaka Creek | Clear Creek | 0 | 1000 GPD |
| S001278 | | | 6/23/1967 | Cold Creek | West Branch Feather River | 0 | 1000 GPD |
| S001287 | | | 6/23/1967 | Fish Creek | West Branch Feather River | 0 | 1000 GPD |
| S001288 | | | 6/23/1967 | High Rock Ravine | Last Chance Creek | 0 | 1000 GPD |
| S001290 | | | 6/23/1967 | Discovery Creek | Last Chance Creek | 0 | 1000 GPD |
| S001293 | | | 6/23/1967 | West Branch Butte Creek | Butte Creek | 0 | 1000 GPD |
| S001294 | | | 6/23/1967 | Haw Creek | Butte Creek | 0 | 1000 GPD |
| S001297 | | | 6/23/1967 | Inskip Creek | Butte Creek | 0 | 1000 GPD |
| S001298 | | | 6/23/1967 | West Branch Feather River | Feather River | 0 | 1000 GPD |
| S001299 | | | 6/23/1967 | Secret Creek | Bull Creek | 0 | 1000 GPD |
| S001303 | | | 6/23/1967 | Bull Creek | Butte Creek | 0 | 1000 GPD |
| S001304 | | | 6/23/1967 | Coon Creek | Bull Creek | 0 | 1000 GPD |
| S001305 | | | 6/23/19667 | Butte Creek | Sacramento River | 0 | 1000 GPD |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S008006 | | | 6/1/1972 | Nesbet Ravine | Butte Creek | 0 | 14400 GPD |
| S008079 | | | 1/1/1973 | UNXX | UNST | 0 | 16.5 GPD |
| S008304 | | | 1/1/1974 | UNSP | Little Butte Creek | 0 | 15120 GPD |
| S008459 | | | 1/1/1975 | Little Butte Creek | Butte Creek | 2,640 | 50 CFS |
| S009901 | | | 6/4/1979 | Ogden Creek | West Branch Feather River | 0 | 320 GPD |
| S009970 | | | 9/14/1979 | Ogden Creek | West Branch Feather River | 0 | 60 GPD |
| S012328 | | | 2/14/1986 | Griffin Gulch | West Branch Feather River | 0 | 5000 GPD |
| S012333 | | | 2/14/1986 | West Branch Butte Creek | Butte Creek | 0 | 5000 GPD |
| S012335 | | | 2/14/1986 | Discovery Creek | Last Chance Creek | 0 | 5000 GPD |
| S012336 | | | 2/14/1986 | Fish Creek | West Branch Feather River | 0 | 5000 GPD |
| S012337 | | | 2/14/1986 | Clear Creek | Butte Creek | 0 | 5000 GPD |
| S012338 | | | 2/14/1986 | Clear Creek | Butte Creek | 0 | 5000 GPD |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S012340 | | | 2/14/1986 | Long Ravine | Little W. Fork Feather River | 0 | 5000 GPD |
| S012341 | | | 2/14/1986 | UNST | West Branch Feather River | 0 | 5000 GPD |
| S012343 | | | 2/14/1986 | Cold Creek | West Branch Feather River | 0 | 5000 GPD |
| S012344 | | | 2/14/1986 | Long Ravine | Little W. Fork Feather River | 0 | 5000 GPD |
| S012345 | | | 2/14/1986 | Little W. Fork Feather River | West Branch Feather River | 0 | 5000 GPD |
| S012346 | | | 2/14/1986 | Long Ravine | Little W. Fork Feather River | 0 | 5000 GPD |
| S012355 | | | 2/14/1986 | Cedar Creek | West Branch Butte Creek | 0 | 5000 GPD |
| S012357 | | | 2/14/1986 | Last Chance Creek | West Branch Feather River | 0 | 5000 GPD |
| S012370 | | | 2/14/1986 | UNST | Butte Creek | 0 | 5000 GPD |
| S012371 | | | 2/14/1986 | West Branch Feather River | Feather River | 0 | 5000 GPD |
| S013196 | | | 9/15/1988 | UNSP | Butte Creek | 0 | 0.401 CFS |
| S013427 | | | 5/4/1990 | Little Butte Creek | Butte Creek | 70 | 4 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S013619 | | | 3/25/1991 | Concow Creek | Concow reservoir | 0 | 0.044 CFS |
| S013623 | | | 3/25/1991 | Lockerman Creek | Camp Creek | 0 | 0.445 CFS |
| S013624 | | | 3/25/1991 | UNST | Lockerman Creek | 0 | 0.178 CFS |
| S013625 | | | 3/25/1991 | Camp Creek | Lockerman Creek | 0 | 0.178 CFS |
| S013634 | | | 3/25/1991 | Long Ravine | Little West Fork | 0 | 0.445 CFS |
| S013635 | | | 3/25/1991 | Big Kimshew Creek | West Branch Feather River | 0 | 0.445 CFS |
| S013637 | | | 3/25/1991 | Little Kimshew Creek | Big Kimshew Creek | 0 | 0.445 CFS |
| S013638 | | | 3/25/1991 | Keyser Creek | Big Kimshew Creek | 0 | 0.445 CFS |
| S013639 | | | 3/25/1991 | UNST | Breakneck Canyon | 0 | 0.044 CFS |
| S013646 | | | 3/25/1991 | West Branch Butte Creek | Butte Creek | 0 | 0.445 CFS |
| S013647 | | | 3/25/1991 | Platt Ravine | Butte Creek Feather River | 0 | 0.178 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S013649 | | | 3/25/1991 | UNST | Gallager Ravine | 0 | 0.445 CFS |
| S013651 | | | 3/25/1991 | Little Kimshew Creek | Big Kimshew Creek | 0 | 0.445 CFS |
| S013652 | | | 3/25/1991 | UNST | Little Kimshew Creek | 0 | 0.0445 CFS |
| S013653 | | | 3/25/1991 | Keyser Creek | Kimshew Creek | 0 | 0.445 CFS |
| S013654 | | | 3/25/1991 | Keyser Creek | Kimshew Creek | 0 | 0.178 CFS |
| S013660 | | | 3/25/1991 | UNSP | UNST | 0 | 0.044 CFS |
| S013661 | | | 3/25/1991 | Web Hollow | Big Chico Creek | 0 | 0.044 CFS |
| S013662 | | | 3/25/1991 | West Branch Butte Creek | Butte Creek | 0 | 0.044 CFS |
| S013663 | | | 3/25/1991 | Clear Creek | Butte Creek | 0 | 0.178 CFS |
| S013668 | | | 3/25/1991 | Last Chance Creek | West Branch Feather River | 0 | 0.445 CFS |
| S013669 | | | 3/25/1991 | UNST | Inskip Creek | 0 | 0.044 CFS |
| S013670 | | | 3/25/1991 | Inskip Creek | Butte Creek | 0 | 0.445 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S013673 | | | 3/25/1991 | Fish Creek / West Branch | Fish Creek | 0 | 0.178 CFS |
| S013674 | | | 3/25/1991 | Big Kimshew Creek | West Branch Feather River | 0 | 0.044 CFS |
| S013675 | | | 3/25/1991 | Brown Ravine | Last Chance Creek | 0 | 0.178 CFS |
| S013676 | | | 3/25/1991 | Secret Creek | Bull Creek | 0 | 0.178 CFS |
| S013677 | | | 3/25/1991 | UNST | Bull Creek | 0 | 0.044 CFS |
| S013678 | | | 3/25/1991 | UNST | Bull Creek | 0 | 0.178 CFS |
| S013681 | | | 3/25/1991 | UNST | West Branch Feather River | 0 | 0.178 CFS |
| S013683 | | | 3/25/1991 | Alder Creek | Butte Creek | 0 | 0.178 CFS |
| S013686 | | | 3/25/1991 | Bull Creek | Butte Creek | 0 | 0.178 CFS |
| S013687 | | | 3/25/1991 | West Branch Feather River | Oroville reservoir | 0 | 0.178 CFS |
| S013688 | | | 3/25/1991 | Grizzly (UNST) | Butte Creek | 0 | 0.178 CFS |
| S013692 | | | 3/25/1991 | Malloy Creek (UNST) | Butte Creek | 0 | 0.044 CFS |
| S013693 | | | 3/25/1991 | Big Chico Creek | Sacramento River | 0 | 0.455 CFS |

| App. No. | Permit No. | License No. | App. Date | Source Stream | Trib. Stream | Max Storage | Max Direct Diversion |
|---|---|---|---|---|---|---|---|
| S013698 | | | 6/6/1991 | Butte Creek | Sacramento River | 0 | 0.066 CFS |
| S014232 | | | 9/29/1994 | UNST | Little Butte Creek | 0 | 0.022 CFS |

# APPENDIX E

# W2 Model Simulation Results

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Table E-1. W2 Simulation Results: Difference between base case and simulation from Julian day 170 (6/19) to Julian day 220 (8/08) using the 2005 calibrated model (above normal hydrology, hot meteorology). (Source: PG&E, 2008b)

| | Simulation | Location | Mean Temp. Difference, C | Largest Change in Daily Maximum Temp. (+/-), C | Jday of Largest Temp. Difference | WMMT* (JD195-201), C |
|---|---|---|---|---|---|---|
| 1 | 60 cfs below Lower Centerville Diversion Dam (LCDD) | Butte Creek Below Centerville Powerhouse | 0.05 | 0.41 | 215 | 0.08 |
| | | Butte Creek Above Centerville Powerhouse | -0.13 | -0.55 | 174 | 0.04 |
| | | Butte Creek at Helltown | -0.11 | -0.52 | 174 | 0.00 |
| 2 | 80 cfs below LCDD | Butte Creek Below Centerville Powerhouse | 0.09 | 0.63 | 215 | 0.32 |
| | | Butte Creek Above Centerville Powerhouse | -0.43 | -0.99 | 212 | -0.63 |
| | | Butte Creek at Helltown | -0.34 | -0.72 | 215 | -0.44 |
| 3 | All DeSabla Powerhouse (DSPH) flow in Butte Creek | Butte Creek Below Centerville Powerhouse | 0.16 | 1.17 | 202 | 0.67 |
| | | Butte Creek Above Centerville Powerhouse | -1.20 | -2.34 | 196 | -2.13 |
| | | Butte Creek at Helltown | -0.92 | -2.06 | 196 | -1.91 |
| 4 | 20 cfs release into WBFR (Remove 5 cfs @ Hendricks Head Dam [HHD]) | Butte Creek Below Centerville Powerhouse | 0.07 | 0.14 | 211 | 0.12 |
| | | Butte Creek Above Centerville Powerhouse | 0.03 | -0.11 | 191 | 0.03 |
| | | Butte Creek at Helltown | 0.03 | 0.07 | 213 | 0.03 |
| 5 | 30 cfs release into WBFR (Remove 15 cfs @ HHD) | Butte Creek Below Centerville Powerhouse | 0.20 | 0.45 | 214 | 0.38 |
| | | Butte Creek Above Centerville Powerhouse | 0.08 | 0.23 | 197 | 0.12 |
| | | Butte Creek at Helltown | 0.08 | 0.20 | 213 | 0.11 |
| 6 | 50% Reduction in DeSabla Forebay (DSF) thermal loading | Butte Creek Below Centerville Powerhouse | -0.17 | -0.68 | 213 | -0.36 |
| | | Butte Creek Above Centerville Powerhouse | -0.14 | -0.67 | 170 | -0.29 |
| | | Butte Creek at Helltown | -0.15 | -0.69 | 170 | -0.34 |
| 7 | 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.27 | -1.10 | 213 | -0.60 |
| | | Butte Creek Above Centerville Powerhouse | -0.22 | -1.08 | 170 | -0.52 |
| | | Butte Creek at Helltown | -0.24 | -1.11 | 170 | -0.58 |
| | | Butte Creek at Pool 4 | -0.25 | -1.00 | 170 | -0.61 |
| | | Butte Creek at Quartz Bowl | -0.31 | -1.04 | 213 | -0.51 |

| | Simulation | Location | Mean Temp. Difference, C | Largest Change in Daily Maximum Temp. (+/-), C | Jday of Largest Temp. Difference | WMMT* (JD195-201), C |
|---|---|---|---|---|---|---|
| 8 | 60 cfs below LCDD and 50% reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.12 | -0.63 | 170 | -0.27 |
| | | Butte Creek Above Centerville Powerhouse | -0.27 | -0.96 | 170 | -0.26 |
| | | Butte Creek at Helltown | -0.26 | -0.94 | 170 | -0.32 |
| 9 | 60 cfs below LCDD and 80% reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.22 | -1.02 | 170 | -0.49 |
| | | Butte Creek Above Centerville Powerhouse | -0.36 | -1.37 | 170 | -0.44 |
| | | Butte Creek at Helltown | -0.35 | -1.35 | 170 | -0.52 |
| | | Butte Creek at Pool 4 | -0.36 | -1.26 | 212 | -0.68 |
| | | Butte Creek at Quartz Bowl | -0.32 | -1.14 | 213 | -0.53 |
| 10 | All DSPH flow in Butte Creek and 50% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | 0.00 | -0.79 | 170 | 0.24 |
| | | Butte Creek Above Centerville Powerhouse | -1.37 | -2.73 | 200 | -2.56 |
| | | Butte Creek at Helltown | -1.09 | -2.72 | 200 | -2.39 |
| 11 | All DSPH flow in Butte Creek and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.11 | -1.21 | 170 | 0.00 |
| | | Butte Creek Above Centerville Powerhouse | -1.47 | -3.11 | 212 | -2.80 |
| | | Butte Creek at Helltown | -1.20 | -3.13 | 200 | -2.66 |
| | | Butte Creek at Pool 4 | -1.01 | -3.12 | 200 | -2.60 |
| | | Butte Creek at Quartz Bowl | -0.40 | -1.37 | 213 | -0.60 |
| 12 | 20 cfs release into WBFR (Remove 5 cfs @ HHD)and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.26 | -1.21 | 170 | -0.37 |
| | | Butte Creek Above Centerville Powerhouse | -0.23 | -0.67 | 213 | -0.44 |
| | | Butte Creek at Helltown | -0.25 | -0.69 | 213 | -0.47 |
| 13 | 20 cfs release into WBFR (Remove 5 cfs @ HHD), 80% Reduction in DSF thermal loading and All DSPH flow in Butte Creek | Butte Creek Below Centerville Powerhouse | -0.10 | -0.78 | 171 | 0.14 |
| | | Butte Creek Above Centerville Powerhouse | -1.46 | -2.84 | 196 | -2.66 |
| | | Butte Creek at Helltown | -1.20 | -2.71 | 200 | -2.49 |
| 14 | 30 cfs release into WBFR (Remove 15 cfs @ HHD) and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.14 | -0.61 | 170 | -0.13 |
| | | Butte Creek Above Centerville Powerhouse | -0.20 | -0.67 | 170 | -0.39 |
| | | Butte Creek at Helltown | -0.22 | -0.73 | 170 | -0.44 |

| | Simulation | Location | Mean Temp. Difference, C | Largest Change in Daily Maximum Temp. (+/-), C | Jday of Largest Temp. Difference | WMMT* (JD195-201), C |
|---|---|---|---|---|---|---|
| 15 | 30 cfs release into WBFR (Remove 15 cfs @ HHD); 2 cfs removed from Hendricks feeders, 2 cfs removed from the Butte Canal, and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.09 | -0.38 | 170 | -0.04 |
| | | Butte Creek Above Centerville Powerhouse | -0.18 | -0.56 | 213 | -0.39 |
| | | Butte Creek at Helltown | -0.20 | -0.57 | 213 | -0.43 |
| | | Butte Creek at Pool 4 | -0.20 | -0.61 | 170 | -0.47 |
| | | Butte Creek at Quartz Bowl | -0.24 | -0.55 | 190 | -0.23 |

* WMMT = Weekly Mean of the Daily Maximum Temperatures during the hottest week of the summer.

Table E-2. W2 Simulation Results: Difference between base case and simulation from Julian day 170 (6/19) to Julian day 220 (8/08) using 2001 hydrology and 2005 meteorology (dry hydrology, hot meteorology). (Source: PG&E, 2008b)

| | Simulation | Location | Mean Temp. Difference, C | Largest Change in Daily Maximum Temp. (+/-), C | Jday of Largest Temp. Difference | WMMT* (JD195-201), C |
|---|---|---|---|---|---|---|
| 16 | 60 cfs below LCDD | Butte Creek Below Centerville Powerhouse | 0.34 | 1.30 | 199 | 1.22 |
| | | Butte Creek Above Centerville Powerhouse | -0.57 | -0.65 | 170 | -0.23 |
| | | Butte Creek at Helltown | -0.46 | -0.71 | 201 | -0.42 |
| 17 | 80 cfs below LCDD | Butte Creek Below Centerville Powerhouse | 0.24 | 1.15 | 199 | 1.07 |
| | | Butte Creek Above Centerville Powerhouse | -0.88 | -1.24 | 202 | -0.86 |
| | | Butte Creek at Helltown | -0.71 | -1.05 | 201 | -0.84 |
| 18 | All DSPH flow in Butte Creek | Butte Creek Below Centerville Powerhouse | 0.20 | 1.19 | 202 | 1.00 |
| | | Butte Creek Above Centerville Powerhouse | -1.34 | -2.30 | 202 | -1.45 |
| | | Butte Creek at Helltown | -1.06 | -1.99 | 204 | -1.55 |
| 19 | 12 cfs release into WBFR (Remove 5 cfs @ HHD) | Butte Creek Below Centerville Powerhouse | 0.07 | 0.21 | 198 | 0.18 |
| | | Butte Creek Above Centerville Powerhouse | 0.02 | 0.12 | 202 | 0.02 |
| | | Butte Creek at Helltown | 0.03 | 0.07 | 202 | 0.04 |
| 20 | 15 cfs release into WBFR (Remove 8 cfs @ HHD) | Butte Creek Below Centerville Powerhouse | 0.11 | 0.32 | 197 | 0.28 |
| | | Butte Creek Above Centerville Powerhouse | 0.03 | 0.26 | 202 | 0.03 |
| | | Butte Creek at Helltown | 0.04 | 0.25 | 202 | 0.04 |
| 21 | 22 cfs release into WBFR (Remove 15 cfs @ HHD) | Butte Creek Below Centerville Powerhouse | 0.21 | 0.63 | 198 | 0.55 |
| | | Butte Creek Above Centerville Powerhouse | 0.06 | 0.21 | 202 | 0.07 |
| | | Butte Creek at Helltown | 0.07 | 0.21 | 209 | 0.07 |
| 22 | 50% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.26 | -0.47 | 214 | -0.23 |
| | | Butte Creek Above Centerville Powerhouse | -0.18 | -0.52 | 213 | -0.24 |
| | | Butte Creek at Helltown | -0.20 | -0.66 | 213 | -0.48 |

| | Simulation | Location | Mean Temp. Difference, C | Largest Change in Daily Maximum Temp. (+/-), C | Jday of Largest Temp. Difference | WMMT* (JD195-201), C |
|---|---|---|---|---|---|---|
| 23 | 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.41 | -0.73 | 214 | -0.36 |
| | | Butte Creek Above Centerville Powerhouse | -0.29 | -0.83 | 213 | -0.38 |
| | | Butte Creek at Helltown | -0.32 | -1.05 | 213 | -0.77 |
| | | Butte Creek at Pool 4 | -0.35 | -1.07 | 214 | -0.89 |
| | | Butte Creek at Quartz Bowl | -0.49 | -0.94 | 202 | -0.18 |
| 24 | 60 cfs below LCDD and 50% reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.06 | 0.65 | 180 | 0.47 |
| | | Butte Creek Above Centerville Powerhouse | -0.78 | -1.23 | 202 | -0.77 |
| | | Butte Creek at Helltown | -0.66 | -1.37 | 201 | -0.97 |
| 25 | 60 cfs below LCDD and 80% reduction in DSF Thermal Loading | Butte Creek Below Centerville Powerhouse | -0.21 | 0.62 | 180 | 0.22 |
| | | Butte Creek Above Centerville Powerhouse | -0.92 | -1.59 | 202 | -1.10 |
| | | Butte Creek at Helltown | -0.81 | -1.79 | 201 | -1.34 |
| | | Butte Creek at Pool 4 | -0.87 | -1.98 | 201 | -1.70 |
| | | Butte Creek at Quartz Bowl | -0.56 | -1.14 | 202 | -0.22 |
| 26 | All DSPH flow in Butte Creek and 50% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.05 | 0.80 | 170 | 0.28 |
| | | Butte Creek Above Centerville Powerhouse | -1.60 | -1.73 | 202 | -2.16 |
| | | Butte Creek at Helltown | -1.33 | -2.56 | 202 | -2.25 |
| 27 | All DSPH flow in Butte Creek and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.21 | -0.84 | 201 | -0.10 |
| | | Butte Creek Above Centerville Powerhouse | -1.75 | -2.08 | 202 | -2.55 |
| | | Butte Creek at Helltown | -1.49 | -2.89 | 202 | -2.63 |
| | | Butte Creek at Pool 4 | -1.36 | -2.90 | 202 | -2.72 |
| | | Butte Creek at Quartz Bowl | -0.61 | -1.29 | 202 | -0.24 |
| 28 | 15 cfs release into WBFR (Remove 8 cfs @ HHD) and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.32 | -0.56 | 214 | -0.15 |
| | | Butte Creek Above Centerville Powerhouse | -0.27 | -0.80 | 213 | -0.33 |
| | | Butte Creek at Helltown | -0.30 | -1.02 | 213 | -0.72 |

| | Simulation | Location | Mean Temp. Difference, C | Largest Change in Daily Maximum Temp. (+/-), C | Jday of Largest Temp. Difference | WMMT* (JD195-201), C |
|---|---|---|---|---|---|---|
| 29 | 15 cfs release into WBFR (Remove 8 cfs @ HHD), 80% Reduction in DSF thermal loading and All DSPH flow in Butte Creek | Butte Creek Below Centerville Powerhouse | -0.12 | 0.76 | 170 | 0.13 |
| | | Butte Creek Above Centerville Powerhouse | -1.66 | -2.91 | 202 | -2.32 |
| | | Butte Creek at Helltown | -1.41 | -2.58 | 202 | -2.40 |
| 30 | 10 cfs release into WBFR (Remove 3 cfs @ HHD) and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.38 | -0.65 | 214 | -0.29 |
| | | Butte Creek Above Centerville Powerhouse | -0.28 | -0.81 | 213 | -0.37 |
| | | Butte Creek at Helltown | -0.31 | -1.04 | 213 | -0.75 |
| 31 | 15 cfs release into WBFR (Remove 7 cfs @ HHD); 2 cfs removed from Hendricks feeders; 4 cfs removed from the Butte Canal and 80% Reduction in DSF thermal loading | Butte Creek Below Centerville Powerhouse | -0.24 | -0.39 | 214 | 0.13 |
| | | Butte Creek Above Centerville Powerhouse | -0.25 | -0.77 | 213 | -0.16 |
| | | Butte Creek at Helltown | -0.28 | -1.00 | 213 | -0.61 |
| | | Butte Creek at Pool 4 | -0.30 | -1.02 | 214 | -0.74 |
| | | Butte Creek at Quartz Bowl | -0.43 | -0.51 | 202 | 0.01 |

* WMMT = Weekly Mean of the Daily Maximum Temperatures during the hottest week of the summer.